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SECOND SESSION.

HELD IN NEW YORK CITY, JUNE 3 AND 4, 1890.

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CONTENTS.

PAGE

List of Officers for the Year 1890–91 v

List of Members for the Year 1890–91 v

Minutes of the Second Annual Meeting 1

I. The President's Address. By J. LEWIS SMITH, M.D., Clinical Professor of Pediatrics in Bellevue Hospital Medical College, New York 6

II. Spurious Meningocele; Traumatic Cephalohydrocele; Acquired Cephalocele. By FRANCIS HUBER, M.D., Chief of Pediatric Clinic in the Vanderbilt Clinic of the College of Physicians and Surgeons, New York 10

III. A Case of Empyema with Expectoration of Pus: Thoracocentesis. By J. HENRY FRUITNIGHT, M.D., New York 28

IV. Some Manifestations of Rachitis not always associated with Severe Bone Changes. By WALTER LESTER CARR, M.D., New York 33

V. A Case of Transposition of the Aorta and Pulmonary Artery, with Patent Foramen Ovale: Death at Ten Years of Age. By JOHN DORNING, M.D., Instructor in Pediatrics in the Post-Graduate Medical School and Hospital, New York 46

VI. The Etiology of Empyema in Children. (Illustrated.) By HENRY KOPLIK, M.D., New York 50

VII. Dactylitis in Children. (Illustrated.) By LEONARD S. RAU, M.D., New York 60

VIII. A Case of Sarcoma of the Kidney. (Illustrated.) By FREDERIC M. WARNER, M.D., New York 65

IX. On what Early Symptoms may we rest a Diagnosis of Tubercular Meningitis? By W. P. NORTHRUP, M.D., Pathologist of the New York Infant Asylum, New York 69

X. The Management of Human Breast-Milk in Cases of Difficult Infantile Digestion. By T. M. Rotch, M.D., Assistant Professor of Pediatrics in the Medical Department of Harvard University, Boston 88

XI. Summer Diarrhœa in Infants: being an Analysis of the Cases Treated at the Sea-Shore Home during the Summers of 1887, 1888, and 1889. By CHARLES W. TOWNSEND, M.D., Boston . 101

XII. A Contribution to the Chemical Study of the Summer Diarrhœas of Infancy. By VICTOR C. VAUGHAN, M.D., Ann Arbor, Mich. 109

PAGE

XIII. Some Points in the Etiology and Treatment of the Diarrhœal Diseases of Infancy. By FLOYD M. CRANDALL, M.D., New York 115

XIV. How to Prevent Scarlet Fever. By J. LEWIS SMITH, M.D., New York 129

XV. How to Prevent Diphtheria. By AUGUSTUS CAILLÉ, M.D., Instructor in Pediatrics in the Post-Graduate Medical School and Hospital, New York 136

XVI. The Use of Alcohol in the Treatment of the Diseases of Children. By A. SEIBERT, M.D., Professor of Pediatrics in the New York Polyclinic, New York 148

XVII. The Use of Alcohol in the Treatment of the Diseases of Children. By JOSEPH E. WINTERS, M.D., Clinical Professor of Pediatrics in the Medical Department of the New York University, New York 152

XVIII. A Fatal Case of Purpura, with a few Notes on the Recent Literature of this Disease. By HENRY JACKSON, M.D., Boston . 158

XIX. Observations upon the Capacity of the Stomach in Infancy. By L. EMMETT HOLT, M.D., Professor of Pediatrics in the New York Polyclinic, New York 168

XX. Result of Asphyxia, of Shorter or Longer Duration, immediately after Birth (with Presentation of Case). By A. JACOBI, M.D., Clinical Professor of Pediatrics in the College of Physicians and Surgeons, New York 178

XXI. The Construction of O'Dwyer Tubes, with a Report of Three Hundred and Fifty Cases of Intubation of the Larynx. By DILLON BROWN, M.D., Instructor in Intubation in the New York Polyclinic, New York 182

XXII. Simple but Efficient Medication in Pediatrics. By CHAS. WARRINGTON EARLE, M.D., Professor of Pediatrics, Woman's Medical College, Chicago 198

XXIII. Suppurative Peritonitis. By JOHN J. REID, M.D., New York 204

XXIV. A Case of Congenital Influenza. By CHARLES W. TOWNSEND, M.D., Boston 205

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MINUTES

OF THE

SECOND ANNUAL MEETING

OF THE

AMERICAN PEDIATRIC SOCIETY,

HELD IN NEW YORK CITY, JUNE 3 AND 4, 1890.

June 3, 1890.—*First Day, Morning Session.*

THE President, J. Lewis Smith, M.D., of New York, called the meeting to order at 11.30 o'clock, in the Mott Memorial Hall, Madison Avenue and Twenty-seventh Street.

The following members were present:

C. E. Billington, New York; A. D. Blackader, Montreal; W. D. Booker, Baltimore; Dillon Brown, A. Caillé, W. L. Carr, H. D. Chapin, John Dorning, New York; Charles Warrington Earle, Chicago; J. H. Fruitnight, L. Emmett Holt, Francis Huber, New York; Henry Jackson, Boston; A. Jacobi, Henry Koplik, New York; H. Lafleur, Baltimore; W. P. Northrup, Joseph O'Dwyer, John J. Reid, New York; T. M. Rotch, Boston; B. Scharlau, August Seibert, J. Lewis Smith, New York; Charles W. Townsend, Boston; V. C. Vaughan, Ann Arbor; William Perry Watson, Jersey City; J. E. Winters, New York.

On motion, the minutes of the last annual meeting were approved as published.

On motion, it was ordered that all the papers presented to

this meeting, with the discussions thereon, be furnished exclusively to the ARCHIVES OF PEDIATRICS for publication therein; the publishers in turn agreeing to make three hundred reprints thereof for the society free of all expense, and similar to those furnished at the last meeting.

Dr. J. Lewis Smith then delivered his annual address.

Dr. T. M. Rotch then read a paper on "Management of Human Breast-Milk in Cases of Difficult Infantile Digestion," which was discussed by Drs. Jacobi, Holt, Fruitnight, and Blackader.

Dr. Francis Huber then read a paper (with presentation of case) on "Spurious Meningocele."

Dr. W. P. Northrup then read a paper entitled "On what Early Symptoms may we base a Diagnosis of Tubercular Meningitis?"

The time for adjournment having arrived, it was moved and carried that the discussion on Dr. Northrup's paper be postponed until the afternoon session.

First Day.—Afternoon Session.

Society called to order by President Smith at 3.30 o'clock.

Dr. Northrup's paper was then discussed by Drs. Earle, Rotch, Jacobi, Winters, Caillé, Fruitnight, Watson, and the President.

Dr. Carr then read a paper on "Some Manifestations of Rachitis not always associated with Severe Bone Changes."

Dr. Jackson then read a paper on "A Fatal Case of Purpura Hæmorrhagica," which was discussed by Drs. Earle, Booker, Jacobi, Rotch, Koplik, Fruitnight, and the President.

Adjournment.

First Day.—Evening Session.

Society called to order by President Smith at 8 o'clock.

Dr. Brown read a paper on the "Technique of Intubation, with a Report of Three Hundred and Fifty Cases," which was discussed by Drs. Earle and Caillé.

Dr. Holt then read a paper on "Some Observations on the Stomach Capacity of Infants" (with specimens), which was discussed by Drs. Rotch, Seibert, Earle, and Jacobi.

Dr. Earle then read a paper on "Simple but Efficient Medication in Pediatrics," which was discussed by Drs. Carr, Holt, Seibert, Koplik, and Fruitnight.

The general discussion on the "Use of Alcohol in the Treatment of the Diseases of Children" was then opened by Drs. Seibert and Winters, and continued by Drs. Jacobi, the President, Chapin, Vaughan, Rotch, Holt, and Fruitnight.

The following papers were then read by title:

"A Case of Purulent Peritonitis," by Dr. Reid; "A Case of Sarcoma of the Kidney" (by invitation), by F. M. Warner, M.D., of New York.

On motion, a committee, composed of Drs. Booker and Winters, was appointed to consider the recommendations in the President's address and report upon the same at the executive meeting.

Adjournment.

June 4, 1890.—*Second Day.—Morning Session.*

Society called to order by the President at 11.30 o'clock.

The Council reported the following nominations to office and membership, and, on motion, it was resolved that the report be accepted and the nominations confirmed.

President.—T. M. Rotch, M.D., Boston.

First Vice-President.—V. C. Vaughan, M.D., Ann Arbor.

Second Vice-President.—Joseph O'Dwyer, M.D., New York.

Secretary.—W. D. Booker, M.D., Baltimore.

Recorder.—William Perry Watson, M.D., Jersey City.

Treasurer.—Charles Warrington Earle, M.D., Chicago.

COUNCIL.

T. S. Latimer, M.D., Baltimore; J. M. Keating, M.D., Philadelphia; I. N. Love, M.D., St. Louis, C. P. Putnam, M.D., Boston; A. D. Blackader, M.D., Montreal; L. Emmett Holt, M.D., New York; W. P. Northrup, M.D., New York.

BUSINESS COMMITTEE OF THE COUNCIL.

L. E. Holt, *chairman;* A. D. Blackader, W. P. Northrup.

NEW MEMBERS.

M. P. Hatfield, M.D., Chicago; W. S. Christopher, M.D.,

Cincinnati; Jerome Walker, M.D., Brooklyn; and O. P. Rex, M.D., Philadelphia.

The following amendments to the Constitution, proposed at the last annual meeting, were adopted, viz.: To Article XIV., after paragraph 3, "Should any paper be too long to be read in twenty minutes, the writer must prepare an abstract which can be read within that time." To Article XIV., in paragraph 5, insert after the word Council, "two months before the annual meeting." After paragraph 5, Article XIV., "Members who have papers to present to the Society at the regular annual meeting shall furnish an abstract to the Council six weeks before the meeting for distribution to members." To Article X. insert at end, "All papers presented shall become the property of the Society." Instead of Article V., the following: "Each member shall pay an annual fee, the amount of which shall be decided upon at each annual meeting. Honorary members shall be exempted from fees."

The committee to consider the recommendations in the President's address reported favorably upon the following:

1. The next meeting of the Society shall be held in September, 1891.

2. The subjects for discussion must be selected by the Council, and notice of the same sent to members of the Society six months before the regular annual meeting.

3. The final programme must be sent to members of the Society two months before the annual meeting.

All of which was concurred in by the Society.

The recommendation that South America, Mexico, and the West Indies be embraced within the limits for active membership was not concurred in by the Society.

Drs. A. Jacobi, J. O'Dwyer, A. Seibert, W. P. Northrup, and A. Caillé were elected delegates to the Tenth International Medical Congress.

The proposals for membership were referred to the Council.

Dr. Townsend then read a paper on "Summer Diarrhœa of Infants."

Dr. Vaughan then read a paper on "Contribution to the Chemical Study of the Summer Diarrhœas of Infancy."

Dr. F. M. Crandall, of New York (by invitation), then read a paper on "Some Points in the Etiology and Treatment of the Diarrhœal Diseases of Infancy."

Dr. Chapin read a paper on the sterilization of milk.

These papers were declared by the President to be open for discussion, which was participated in by Drs. Booker, Fruitnight, Holt, and Blackader.

Adjournment.

Second Day.—Afternoon Session.

Society called to order by President Smith at 3.30 o'clock.

Dr. Townsend read a paper on "A Case of Congenital Influenza." Discussed by Drs. Blackader, Northrup, Fruitnight, Holt, Dorning, Jacobi, and the President.

Dr. Dorning then read a paper on "Congenital Cardiac Disease" (with specimen).

Dr. Jacobi then presented a case of cretinism (modern), with remarks.

Dr. Koplik then read a paper on "Etiology of Empyema in Children," and Dr. Fruitnight read a paper (with presentation of patient) on "A Case of Empyema with Expectoration of Pus: Thoracocentesis," which were discussed by Drs. Scharlau, Carr, Booker, and Shaw.

The subject for general discussion, "How to prevent Diphtheria and Scarlet Fever," was then opened,—"Diphtheria" by Dr. Caillé, and "Scarlet Fever" by the President, and the discussion was continued by Drs. Billington and Earle.

The following papers were read by title:

"Dactylitis in Children" (by invitation), by L. S. Rau, M.D., New York; "A Case of Dextro-Cardia with Rudimentary Lung," by Dr. Jacobi.

On motion, a vote of thanks was extended to the President for his efforts in behalf of the successful meeting now closing.

On motion of Dr. Earle, the thanks of the visiting members were extended to the local members for the hospitable manner in which they had been entertained.

On motion, the Society adjourned subject to the call of the Council.

THE PRESIDENT'S ADDRESS.

BY J. LEWIS SMITH, M.D.,
New York.

SPEAKING in behalf of its New York members, I welcome the American Pediatric Society to this city. It is a cause of thankfulness that our number since we last convened is unbroken by death. I congratulate the Society on the great interest manifested by its members in the work of the Society, and the determination exhibited to make this one of the most useful and foremost scientific bodies in America. Indeed, my only embarrassment arises from the large number of excellent papers which have been presented, which should be read and discussed during the two days of our sessions, and the consciousness that in the limited time allowed justice cannot be done to their merits.

The year which has passed since we last met has been one of great activity and marked increase of interest in the study of diseases of children, and a glance at the literature which it has furnished will show that members of our Society have been among the foremost in instructing the profession in a correct knowledge of the maladies of early life, and in inculcating new and improved modes of treatment. The "Cyclopædia of the Diseases of Children," the production of which ten years ago would have been impossible, and which will be an invaluable boon, a most important educator, to the profession wherever the English language is spoken, will remain when the present generation has passed away, a monument to the untiring industry, good judgment, and profound knowledge of one of our members. The year that has passed has also witnessed the extension and proper appreciation, not only in our country but throughout Europe, of intubation, which, originating with one of our members, has proved to be one of the most important contributions to the surgical or mechanical treatment of diseases of the present century. Its remarkable simplicity, and the quick relief which it gives in all forms of laryngeal stenosis, commend it to the profession wherever it has been practised.

Some of our members are deterred from active participation in the present sessions of the Society in consequence of their relations to the Section of Diseases of Children of the American Medical Association, which has claimed and received all the time that they were able to bestow, and such papers on pediatric subjects as they were able to furnish. The near approach also of the Tenth International Medical Congress, with its important Section of Diseases of Children, has deprived us of certain valuable papers. But every society whose object is to promote a more accurate knowledge of the diseases of children, and a better mode of treatment, should have the sympathy, and so far as possible the assistance, of the members of our Society, for it matters little through what channel any important discovery or fact relating to pediatrics becomes known to the profession.

Now that the American Pediatric Society has reached the second year of its existence, and its continuance is assured, it is proper to consider in what way it can most efficiently and successfully accomplish the purpose for which it was organized,—to wit, as expressed at its first meeting, "The scientific study of the diseases of children." We have stated that the times are auspicious. Only a few years ago the diseases of children were ignored in the curriculum of instruction in the colleges; no medical journal devoted to pediatrics existed in this country, and no department of pediatrics in any of the journals; no society or section of a society made the study of diseases of children its object. Now all these aids or agencies exist to promote advancement in pediatrics. What part shall this Society take in the work of the future? There is no reason why, with the well-known ability and industry of its members, with the abundant opportunity for the study of diseases of children afforded by the college clinics, the asylums, and dispensaries, with the medical journals in all our cities ready to publish our papers and proceedings, and with a most able and successful monthly devoted to pediatrics, conducted by one of our members,—there is no reason why this Society should not take the lead in the achievements of the future.

In my opinion, this Society should remain entirely distinct from any other medical organization, should have its own

separate times for holding its meetings, and the contributions to medical literature which it will make should be entirely distinct from those of any other society, whatever may be the merits of the latter. I have seen, as president of the Pediatric Section of the Ninth International Medical Congress, valuable papers by such men as Bouchut, Moncorvo, Jules Simon, Baginsky, and Oscar Wyss, published in cumbersome and unwieldy volumes with the material of other sections, lost sight of, neither the papers nor a *résumé* of their contents coming to the knowledge of the profession generally. Let our Society exist without affiliation or coalition with any other society, so that its papers and proceedings will be published in small and portable volumes, which we can carry with us when attending to professional engagements and read at our leisure.

It seems to me that our organization should have a wider membership; should be American, as its name indicates. Let us invite to membership and co-operation distinguished physicians of Mexico, the West Indies, and the South American States. When acting as president of the Section of Diseases of Children of the Ninth International Medical Congress, and soliciting papers from all parts of the world, the first to arrive were three from South America, sent by Moncorvo, of Brazil. I believe, from my knowledge of him, that he would furnish a paper for each meeting of the Society, giving the results of his observations in that distant country, and that he would aid in the selection of suitable physicians for membership in the South American States. The recent Pan-American Alliance will soon facilitate intercourse between North and South America, and bring the medical profession of the two continents into closer relation, so that the suggestion which I make seems to me feasible. The correspondence which I have had with members of the Society in preparing for the annual meeting induces me to make the following suggestions: First, that the sessions of this Society hereafter be in the autumn, as, for instance, in the third week in September. The members of the Society are for the most part busy practitioners, but many of them take a summer vacation, during the leisure of which they will have more time to prepare papers to be read

before the Society than they could possibly have during the winter and spring months. Moreover, this year some of our members, who so far as professional engagements are concerned might attend our meetings in the autumn, have found it very inconvenient to be present, on account of the fact that it was necessary that they should attend the meetings of other important medical societies that have recently convened. An autumnal meeting of our Society will, I think, conflict but little with the claims of other societies.

I suggest also that hereafter the Council announce to the members of the Society the two subjects for discussion required by the by-laws at least six months before the annual meeting, so that there will be ample time for preparation for those who may wish to participate in the discussion. Adequate preparation for the discussion of certain subjects requires experiments, clinical observations, and the collecting of statistics, which, properly performed, might occupy half a year. Members who have desired to participate in the proceedings have complained because the programme did not appear earlier, so that in the future it would be well, in my opinion, to announce the completed programme one month before the annual meeting.

It is evident from the announcement in our programme of so many papers on interesting subjects that there may not be sufficient time for their discussion. This inconvenience was also experienced at the sessions of the Pediatric Section of the Ninth International Medical Congress, and the unusual expedient was resorted to of allowing members who wished to discuss papers, but did not have the opportunity, to send in writing the remarks which they desired to make to the secretary, so that they could be published in the proceedings. It is certainly the wish of all of us that the discussions, as they are presented to the profession in the printed transactions, be creditable to the Society and not inferior in merit to the valuable papers which they will accompany. It will be the duty of the Council, who have prepared so good a programme, to see to it that the discussions as they appear in print be worthy of the subjects which are discussed. It is so important that the proceedings of this Society be of a high order and favorably

received by the profession that I recommend that the precedent, which I have alluded to, furnished by the Pediatric Section of the Ninth International Congress be followed. I recommend that if a member have opinions which seem to him important, or facts which may throw light on a subject under discussion, and do not have time to present them during the discussion, he may have the privilege of sending them, in writing, as briefly expressed as possible, to the secretary, and, if the Council approve, they may be published with the proceedings.

SPURIOUS MENINGOCELE; TRAUMATIC CEPHALOHYDROCELE; ACQUIRED CEPHALOCELE.

BY FRANCIS HUBER, M.D.,
New York.

OSLER, who has carefully studied one hundred and fifty cases of cerebral palsies of children, one hundred and twenty of this number being hemiplegic, sums up as follows: Infantile hemiplegia is probably the result of a variety of different processes, of which the most important are—

1. Hemorrhage, occurring during violent convulsions or during a paroxysm of whooping-cough.
2. Post-febrile processes: (*a*) embolic; (*b*) endo- and periarterial changes; and (*c*) encephalitis.
3. Thrombosis of the cerebral veins.

Of the one hundred and twenty cases of hemiplegia, nine were due to or followed injury with the forceps.

Drs. Peterson and Sachs, who, in their paper, have analyzed one hundred and forty cases, report a much larger proportion following the use of instruments in labor. In the special monograph, relating to cerebral palsies in early life, a greater or less number are accredited to the use of the obstetrical forceps. None of the cases, however, possess the special features of my little patient, and I quote the authorities merely to show

the infrequency of the variety represented by the patient now to be introduced.

The patient, Annie P.,* about four and a half years old, is apparently a well-developed, healthy, and moderately bright-looking child. Walks with left toe everted and tendency to drag. Whole left lower extremity "swung" somewhat, and smaller than right. Left hand in a state of moderate contracture; forearm slightly flexed and pronated. All passive movements possible, but difficult from muscular resistance. Contracture, principally in the pronators and flexors of forearm and arm. No articular changes. Left corner of mouth lower than right, but right corner may be drawn up and out by distortion of right side of head and face. Left corrugator, orbicularis palpebrarum and oris, and levator anguli oris paretic. Tongue straight (?). Right frontal bone flattened and drawn back and down, stretching up and out the right palpebral fissure, and right wall of orbit. zygoma and masseter crowded down and out, producing quite a deformity in front of and above the right ear. On deep palpation there is found a depressed area, occupying nearly the whole of the right parietal region, apparently depressed to about the depth which the loss of the external table of the skull would produce. At no part does the cranial arch appear to be entirely deficient, except at the anterior border of the depressed area, just to the right of the sagittal, and just behind the coronal suture, where there is a visible and tangible cerebral pulsation synchronous with the heart's beat. A large fluctuating tumor occupies the upper and posterior parietal region, some effusion, however, coming down almost to a level with the upper border of the auricle. This lower patch, two by three-quarters inches, is separated from the upper large area by a narrow bridge of bone, *under* which the two cavities communicate, as shown by transmission of fluctuation from one to the other. The cavity of the fluctuating tumor does not extend over the space where the cerebral pulsation is seen. Pressure over tumor does not produce any cerebral symptoms;

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* As determined at an examination made in the latter part of September, 1886, in presence of Dr. R. A. Amidon, to whom my thanks are tendered.

over pulsating area pain is caused. Right pupil is perhaps a trifle larger than left; mobile. Whole of right eyeball displaced up and out with wall of orbit. Fundus oculi normal. Vision, as well as can be tested, good in both eyes.

Left limbs smaller than right. Sensibility to touch and pain apparently intact over whole of left side. Tendon reflex of left knee exaggerated.

The child is well behaved, good natured, and does not have any sudden outburst of temper. She performs her functions normally, and is cleanly in her habits. Conducts herself well at the table, eating slowly and moderately.

Previous history.—The mother has had six children. The first, second, and third were born without any difficulty. The others, the offspring of a second marriage, necessitated instrumental interference before delivery was accomplished. In the case of our little patient, the head not engaging and no progress being made in the labor, forceps were applied a number of times by the attending physician (now deceased). As they slipped off each time, version was performed, and after considerable difficulty the child was extracted in an asphyxiated condition. The usual methods were then resorted to, and after a time the child began to give evidences of life, commenced to scream, and kept on screaming day and night, so that morphia was given to quiet her.

The caput succédaneum was very large, and instead of diminishing kept on increasing from day to day. Fluctuation distinct in the tumor; no discoloration of skin over it noticed at any time. The appetite remained good; bowels moved regularly; no fever. The effusion continued to increase, and one month after birth the swelling extended from right auditory meatus to the temporal ridge of left side (?), and from the supraorbital ridges back to occiput. The child is bright and lively; functions normal. An indistinct bony ring is felt. As the fluid increased the tumor was aspirated, and about twelve ounces of a yellowish liquid were withdrawn. A distinct bony rim could now be felt. Compression was then employed without any permanent good result, the liquid reaccumulating quite rapidly. No internal medicine.

April 1. (Eight months old.)—Tumor is as large as an orange.

Child commences to have convulsive movements in right side of face and slightly so in left hand. Is very restless. Bowels are regular; appetite good.

April 15.—Convulsions are severer and more frequent; now involve the face, left hand, and foot.

May 1.—Convulsions affect both sides of face and extremities; has now about six attacks in twenty-four hours. Takes sodii iodidum gr. v. *t. i. d.* and infusion digitalis.

June 2.—Convulsions are general; no improvement being noted. Compression of tumor does not cause any cerebral disturbance. Three ounces of serous fluid withdrawn by means of aspirator and compression resorted to over the parts. Medication continued.

June 15.—Convulsions same as before tapping; temperature normal.

July 5.—Is now suffering from a severe gastro-intestinal catarrh. The tumor is smaller and not so tense.

August 1.—Has emaciated a good deal; no convulsions since diarrhœa set in. She squints more. Contractured condition of flexors of left upper and lower extremities. The thumb is turned in and the other fingers are closed over it. When an attempt is made to straighten the joints the child cries. The muscles of right side of face do not contract.

September 8.—Bowels still loose, about three passages daily. The tumor appears smaller; the child is very restless and wants to be carried day and night; appears bright and pays attention to everything; voice is clear; hearing good; is very greedy. The iodide and digitalis stopped. Just cut two upper central incisors. The temperature gradually rose from 101° to 104° in four days and then subsided.

September 15.—Bright in appearance, but is very cross and cries a great deal; appetite ravenous; no further convulsions; is still nursed; bowels loose; temperature 101°.

September 25.—Cries so much that the others cannot sleep; Magendie's solution, gradually increased from one to fifteen drops, then given without producing the desired result; bromide and chloral given with better effect.*

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* Prior history condensed from Dr. F. A. Beck's case-book.

It has been my privilege to have seen the case a number of times during its progress. At no time could we cause any cerebral disturbance by pressure upon the tumor; nor was it possible to feel a distinct opening in the base after the sac had been emptied; pulsation never present in the case. The child has been backward in talking; first began to use a few words when two years of age; the command of language is fair; the words are used correctly, but in a hesitating, stammering way. The ravenous appetite continued until she was a little over two years old; now eats moderately and behaves well; only began to walk when nearly four years old; but two convulsive attacks since those referred to above. The seizures were not dependent upon the brain lesion; one was the herald of a severe attack of diphtheria, the local lesions of which were observed in the throat the next day; the second seizure, August, 1889, was occasioned by a very indigestible meal.

For a number of months epileptic attacks, as frequent as six in twenty-four hours, occurred, and medicines seemed to influence them little, if at all. With the onset of a severe gastro-intestinal catarrh, the convulsive seizures ceased, except upon the two occasions referred to. The first preceded an attack of diphtheria, the second was due to excessive indulgence at the table. This feature of the case I shall dismiss with the following quotation from Osler:

"Epilepsy is a distressing symptom for which many of these cases (of cerebral palsies) seek relief. It is well to recognize clearly the cortical nature of the attacks and let the parents know that a cure can rarely be anticipated. It is encouraging, however, to note that the seizures may lessen greatly, and prolonged periods of quiescence are not uncommon."

The chief interest in the case centres in the tumor situated in the right parietal region. At first the diagnosis of cephalæmatoma, with depression of parietal and frontal bones, was made. In a few days the true nature of the trouble was apparent. If we bear in mind the salient points, we ought not to have much difficulty in arriving at a correct diagnosis. The injury to the head during parturition, the marked flattening and depression of the parietal and frontal bones (particularly of the parietal), the presence of a large fluctuating tumor,

which rapidly refilled after each aspiration, and, finally, the chemical identity of the fluid with cerebro-spinal liquor (as determined by Professor A. Jacobi) lead us to the diagnosis of "simple fracture of right parietal bone with effusion of cerebro-spinal fluid under the pericranium." For reasons evident later on, I may add, to complete the diagnosis, laceration of the meninges and brain, with possibly a communication with right lateral ventricle, and the persistence of a dural fistula. At the time of the injury very probably a hemorrhage and laceration of right motor area took place, followed by atrophy or retarded development of the same; deficient ossification of right coronal suture at point of cerebral pulsation; traumatic left infantile hemiplegia with retarded development, and secondary descending degeneration in spinal cord and contracture; moderate imbecility.

Since the above was written, four and a half years ago, the ossification has been completed. In the light of further studies, I would state positively that the right lateral ventricle has been involved, and, furthermore, that a condition of proencephalus exists.

Through the courtesy of Dr. A. W. Newfield, I am enabled to report a second case, occurring in a child nine months old. The mother, while carrying the child in her arms, fell down a flight of stairs; she herself escaped uninjured; the child, however, struck its head, and a tumor developed in the left parietal and temporal regions. The child was stunned, and upon recovering vomited a number of times. Blood escaped from the mouth and nose, and once or twice blood was vomited. In a few days, with the exception of the tumor (at first thought to be a hæmatoma), the little one apparently had recovered from the accident. About a month later fever set in, the child became drowsy and stupid, and I was then requested to see the case. Upon examination, we discovered a *pulsating* tumor about the size of an English walnut, situated a little above and behind the left ear. A fracture of the parietal bone could be made out distinctly, the fragment being raised by the fluid beneath. It could be readily depressed to its normal position; as soon as the pressure was taken off the fragment would spring up. The fracture began about a quarter of an inch anterior to

Professor Conner's Table of Cases (*corrected*, etc.).

Primary Cases (following Simple Fractures).

No.	Reporter.	Authority.	Sex.	Age.	Location of Fracture.	Time of Appearance after Injury.	Operative Treatment.	Result.	Time of Death.	Cause of Death.	Remarks.
1	Marjolin.	Vivien, Thèse de Paris, No. 440, 1883.	M.	16 mos	Upper and posterior left parietal region.	4 months.	2 tappings.	Recovery.	.....	.....	Pulsation noticed.
2	Haward.	London Lancet, July 17, 1869.	M.	19 mos.	Right frontal region.	At once.	1 tapping.	Death.	12 days after puncture.	Meningo-encephalitis.	
3	Girabbes.	Mal. Chirurg. des Enfants, 1869. p. 730.	M.	14 mos.	Posterior right parietal region.	A number of days.	2 tappings, 1 free incision.	Death.	20 days after first tapping.	Meningo-encephalitis.	
4	Potain.	Vivien, op. cit.	F.	7 mos.	Posterior right parietal region.	Unknown.	3 tappings.	Death.	18 days after first puncture.	Meningo-encephalitis.	
5	Erichsen.	Surgery, Am. ed., 1878, vol. i. p. 534.	.....	Child.	Left side of skull.	Very soon.	2 tappings.	Death.	10 days after injury.	Meningo-encephalitis.	Hydrocephalic child.
6	Lucas.	Guy's Hosp. Rep., 1876, p. 363.	F.	2 yrs.	Left temporal region.	About 2 weeks.	1 aspiration.	Death.	21 months after injury.	Meningo-encephalitis.	
7	Emory.	Bul. de la Soc. Anat., 1876, p. 36.	.....	2 yrs.	Frontal region.	Unknown.	1 tapping six months after fall, then free incision.	Death.	.....	Meningitis and erysipelas.	
8	Schmitz.	Handbuch der Chir., Billroth and Lücke, L. 30, S. 152.	.....	5 mos.	Lower right parietal region.	10 days.	3 punctures and compression.	Unknown	.....	.....	Removed from hospital while under treatment; mistaken for hæmatoma.
9	Weinlechner.	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	M.	23 mos.	Posterior right occipital region.	Unknown.	2 punctures.	Death.	9 days after second puncture.	Meningitis.	Pulsation noticed; nothing known as to cause; hydrocephalic; communication with lateral ventricle, post-mortem.
10	Weinlechner.	Jahrbuch f. Kinderheilkunde, B. 18, S. 367.	M.	7 mos.	Right parietal region.	Unknown.	3 punctures with cataract-needle.	Death.	6 days after third puncture.	Meningitis.	Cause unknown; fissure present in parietal bone.

11	Billroth.	Langenbeck's Arch., Bd. 3, S. 398.	F.	At birth.	Right parietal region.	Several days after delivery.	5 punctures (2 iodine injections).	Death.	6 days after fifth puncture.	Meningitis.	2½ years old when seen by B.; injury produced by forceps during delivery; p.-m. showed communication with right lateral ventricle.
12	Kraussold.	Langenbeck's Arch., Bd. 20, S. 828.	.....	9 mos.	Right occipito-parietal region.	Unknown.	2 punctures.	Recovery.	.....	.....	Case not seen until nine months after injury; pulsation noticed.
13	Reckett.	London Lancet, June 4, 1881.	M.	2½ yrs.	Right temporo-parietal region.	2 or 3 days.	1 aspiration.	Recovery.	.....	.....	Squinting noticed at time of detection of tumor, disappeared after tapping; persistent paraplegia from spinal injury.
14	Lucas.	Guy's Hosp. Rep., 1880–81, p. 91.	M.	23 mos.	Left frontal region.	17 days.	1 tapping with hypodermic-needle.	Recovery.	.....	.....	Pulsation noticed.
15	Conner.	Am. Journ. Med. Sci., 1884, p. 107.	M.	12½ years.	Right occipito-parieto-temporal region.	At once.	5 punctures, 1 aspiration.	Recovery.			
16	Conner.	Am. Journ. Med. Sci., 1884, p. 107.	M.	27 mos.	Right parietal region.	At once.	None.	Recovery.	.....	.....	Child hydrocephalic and rachitic.
17	Huber.	.....	F.	4½ yrs.	Right parietal region.	Soon after birth.	3 aspirations, 1 puncture.	Recovery.	.....	.....	Due to use of forceps; left hemiplegia and contracture, etc.
18	Huber.	.....	.....	9 mos.	Left parietal.	Fall.	.....	Death.	1 month.	Meningitis.	Pulsation.
19	T. Smith.	St. Barth. Hosp. Rep., 1884.	M.	8 mos.	Right parieto-occipital region.	6 days.	None.	Death.	2 months.	.....	Ill-nourished, neglected, rickety; death in convulsion two days after admission; fall on head from a height.
20	T. Smith.	St. Barth. Hosp. Rep., 1884.	F.	3 yrs.	Right parieto-occipital region.	Not known.	None.	Alive.	.....	.....	Three years after injury in fairly good health; strumous with diseased knee-joint; pulsation; free communication with interior of skull; fall from a height.
21	R. J. Godlee.	Trans. Lond. Path. Soc., vol. 36.	F.	8 mos.	Right parietal region.	Soon after injury.	Aspirated twice, then laid open and drained.	Death.	26th day.	Meningitis.	Fell 14 feet; pulsation marked when child cried.
22	R. J. Godlee.	Trans. Lond. Path. Soc., vol. 36.	M.	5 mos.	Right occipito-temporal region.	.....	.....	.....	.....	.....	Fell 8 feet; impulse upon crying; first case of T. Smith.

Secondary Cases (following Compound Fractures).

No.	Reporter.	Authority.	Sex.	Age.	Location of Fracture.	Time of Appearance after Injury.	Operative Treatment.	Result.	Time of Death.	Cause of Death.	Remarks.
a	Lawson.	Trans. Path. Soc. Lond., 1870, p. 311.	M.	13½ years.	Left frontal region.	18 months after trephining.	Opened with lancet-point.	Recovery.	.....	.....	Trephined on account of fracture.
b	Barton.	London Lancet, Feb. 12, 1881.	M.	22 yrs.	Left frontal region.	3 days.	Opening with probe of bullet wound on sixth day.	Recovery.	.....	.....	Pistol wound; pulsation noticed; disappearance of tumor and cessation of discharges in less than one week.
c	Verneuil.	Vivien, op. cit.	M.	52 yrs.	Right frontal region.	10 days after cicatrization of scalp wound.	Reopening of wound.	Death.	3½ months.	Abscess in right frontal lobe.	Pistol wound; pulsation noticed.

the lower and posterior portion of the parietal bone, and extended upward about two inches, the base of the fragment being above and about one inch across. At the widest portion of the gap the interval between the fragments was somewhat over half an inch. A well-marked meningitis was present, which caused a fatal result in a few days. Unfortunately, an autopsy could not be obtained.

The literature of the subject is not very extensive. Among the more important contributions may be mentioned an elaborate article by Professor Weinlechner (*Jahrbuch f. Kinderheilkunde*, Bd. xviii. p. 368–387); Professor Conner's report of two cases, and extended remarks (*Amer. Journ. Med. Sciences*, 103–110, vol. lxxxviii.). Lucas (Guy's Hospital Reports, 1876, 1878, 1881) has studied the subject carefully, and reports two cases, in one of which he was able to obtain an autopsy twenty-one months after the injury. In the Reports for 1884, he gives the details and autopsy of a case in which the fluid escaped from the trephine opening fourteen days after operating. The article in the "International System of Surgery" is merely an abstract of Dr. Conner's paper. Erichsen, in his "Surgery," refers to a single case occurring in a hydrocephalic child. Billroth reports one case with an analysis of the fluid. In addition, a few isolated cases are reported, the number of which, since attention has been called to the nature of the trouble, is slowly increasing.*

Table of cases thus far reported: I have excluded three of the cases found in Dr. Conner's table, namely case 9, 10, and 11; they do not properly belong in the category. Weinlechner, under whose care they were, assigns them to the first class to be referred to later.

To these authorities, Billroth, Lucas, Conner, Weinlechner, Thomas Smith, and Godlee, I am largely indebted for the subject-matter embodied in this paper. As Weinlechner's article has not been translated, to my knowledge, I have taken the liberty to quote him extensively.

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* Thomas Smith, in *Brit. Hosp. Rep.*, 1884, cites two new cases under his care. R. J. Godlee, in *Trans. Path. Soc.*, London, vol. xxxvi., two cases, one of which is reported by T. Smith, having come under his care shortly before death.

In the exhaustive paper referred to above, Weinlechner recognizes two pathological states or conditions (clinically distinct and readily differentiated) as possible complications of simple fractures of the vault in children. He has found that the fissures in both cases gradually increase in width until a gap results. In the first class the brain is in direct apposition with fractured bone; in the second class a false or spurious meningocele develops.

I shall refer to the first variety in an incidental manner, and confine the discussion to the consideration of the second division. "A discharge of a clear, watery fluid, precisely similar in its character to the watery discharge from the ear and from the nose, may also take place from any part of the vault of the skull, provided the injury extends not only through the integuments and the bones, but also through the cerebral membranes; laying open, in fact, the space between the visceral arachnoid and the pia mater" (Hewett, "Holmes's System of Surgery," Am. Ed., 1881, p. 634). Whether a lesion limited to the bone and meninges is sufficient to cause this trouble will be discussed later.

Erichsen says the discharge usually takes place through the ear, but it may occur from the nose. Still more rarely it takes place from a wound in the scalp communicating with the fracture; percolating through this, and so being poured out externally (Am. Ed., 1881, vol. i. 537). Doubts often arise as to the source, nature, and clinical significance of a watery flow coming from the nose or ear after a traumatism of the head.

In injuries to the vault, the explanation is evident at once, the flow can only be due to an escape of the cerebro-spinal liquor.

If the scalp be broken (the fracture consequently being simple) the fluid accumulates under the fascia, and we have the affection termed "Acquired Cephalocele," "Traumatic Cephalohydrocele" by Conner, or "Meningocele Spuria" by Weinlechner and Billroth. In the case of compound fracture, the original scalp-wound closing, a similar collection may form at a subsequent date. The latter is exceptional, however, but three cases having been reported.

A spurious meningocele presents the following features: A

soft, fluctuating tumor of varying size (Billroth's, the largest, attained the dimensions of two fists) is found upon the vault. In some cases it has appeared right after an injury, in others a fortnight had elapsed, and in one case four months passed before its development. The percussion wave is distinct and very thin. The integument, normal in color, may be distended to such a degree as to be translucent. Pressure may cause a diminution in size, with or without resulting cerebral disturbances. Pulsation is absent in the greater number of cases. A distinct bony ridge, similar to that observed in cephalæmatoma, is frequently found. The opening in the bone is not evident in every case; sometimes, indeed, it cannot be made out until the fluid (resembling the cerebro-spinal liquor in color and chemical composition) has been removed, the relaxed condition of the sac then permitting a thorough examination of the bone underneath.

From an analysis and study of his cases, Weinlechner found that the original fissures would gradually increase in width, and eventually form larger gaps or openings.

Accepting this fact, it is inferred that the greater number of so-called congenital apertures are probably not congenital, but rather acquired defects, the result of some traumatic influence, forgotten or perhaps concealed to cover up some act of carelessness on the part of the child's attendant.

The development of a fissure into a gap is due to two factors. First, *absorption* of the roughened edges, which increases the space between the fractured portion to a certain extent. The second and main factor is intracranial pressure.* When the meninges are intact, the pressure is evenly distributed by the closed unyielding dural sac, and ligamentous or bony union takes place.

The dura mater being implicated, one or two accidents are possible. In one case the torn meninges with more or less of the wounded brain is forced against the fissure, and in consequence of an adhesive inflammation becomes adherent to the vault. The adjacent bone gradually bulges outward; the margins are separated, and the brain, relieved of its membrane,

* The suggestion has been made by Bowlby that absorption may be due to injury to the growing centre of one of the cranial bones.

rises up and pulsates distinctly in the interspace. The viscus does not appear above the level of the bone during forced expiration even in the most aggravated cases. The tumor, conical in shape, and usually situated in the parietal region, is produced wholly by the bony deformity, the brain pulsating at the bottom of the crater, forming the apex of the swelling.

In this manner a plausible explanation is offered to account for the production of the first variety, cranial gaps with apposition of the brain.

Secondly, when the dura is injured, the subdural, or, if the pia be involved, the subpial, fluid is poured out through the fissure, and the pericranium (loosely attached in children) is raised. If the latter be torn, the collection takes place under the "galea aponeurotica," the aponeurosis of the occipito frontal muscles.

The fluid effused becomes encysted: and forms a spurious meningocele. As the sac is composed of thickened connective tissue only, the new morbid condition must be regarded as a secondary cyst. Hence, to distinguish it from a true meningocele, containing cerebro-spinal fluid and covered by meninges as well, the word false or spurious is prefixed. A rusty, fibrinous deposit, the remains of former hemorrhages, may be observed, even after a lapse of years, upon the inner surface, thus clearly establishing the traumatic origin of this rare and interesting affection. In some of the autopsies the dura has been found universally adherent to the edges of the bony orifice, thus leaving a large opening. In others the space was more or less completely closed by membrane, in which one or more smaller fistulous openings still remained. Complete consolidation is very unlikely in any case in which the opening has been large and the subaponeurotic accumulation great (Conner). Free communication is thereby established between the intra- and extracranial cavities, and the rapid reaccumulation of fluid after aspiration is explained.

The bony deformity is not so great when a false meningocele is present, nor is the gap as wide as in the first variety. The pressure from within has to contend with two obstacles, so to speak, and the energy is partly used in forcing out the fluid. Consequently, less strain is put upon the bone, and, therefore, the bony deformity will be correspondingly less.

Weinlechner believes that the size of the tumor depends upon the depth of the injury. The deeper the laceration of the structures within the skull, the larger the quanity of fluid effused. When the lesion involves the lateral ventricle, the flow is very much favored and the tumor attains its greatest dimensions, particularly if the opening be large.

Lucas, of Guy's Hospital, who has studied the subject in a careful manner, says, "When cerebro-spinal fluid escapes through the vault (whether the fracture be simple or compound), the injury has extended to the ventricular cavity." He asserts that there is no post-mortem evidence to prove that a wound of the visceral layer of the arachnoid was sufficient to account for the presence of the fluid. Compound fractures are by no means rare; in many instances in which the dura and brain are known to have been injured, no fluid has escaped. On the other hand, in every case in which this complication occurred, and in which a careful autopsy has been possible, a communication with the ventricular cavity has been demonstrated. The light thrown upon this condition by the post-mortem examination in two of his cases (in which the symptoms suggested nothing more serious than a wound of the visceral layer of the arachnoid) clearly establishes his position. In Weinlechner's, Godlee's, and Billroth's cases the ventricular cavity was involved. Prescott Hewett, in his essay in "Holmes's System of Surgery," refers to three cases of compound fractures of the vault with escape of fluid, in which the lateral ventricles were found implicated post mortem. The wound or lesion need not extend so deeply at the outset.

Subsequent to the laceration, Lucas has noticed a softening process to supervene, with an increase in the secretion of the cerebro-spinal fluid from inflammation, so that pressure from within and yielding of the brain wall together contribute to the escape of the fluid from the ventricles.* Recovery is no argument against this view, for in children, provided menin-

* A similar observation was made by Keen in the report of his operation for the removal of a brain tumor (*Amer. Jour. Med. Sci.*, October, 1888). The wall yielded on the ninth day, and gave exit daily to a quantity of cerebro-spinal fluid sufficient to wet an ample sublimate dressing continually for three weeks.

gitis does not set in, the most extensive cerebral laceration may be recovered from without grave symptoms. The non-development of the intellectual faculties in children offers the readiest explanation of the favorable result.

As might be inferred from the remarks made, the primary cases occur in early childhood. Lucas maintains that the elasticity and thinness of children's skulls permit or determine the injury upon which this rare phenomenon depends. In adults the strong and firmly ossified calvarium cannot be driven in to a like extent without an accompanying laceration of the scalp. Hence, similar injuries in the adult are compound, and may be followed by an escape of cerebro-spinal liquor through the wound. Collection beneath the scalp takes place in the adult, when the wound in the soft parts has healed. Conner believes that the closer connection of the meninges and skull is another predisposing element in the production of this accident. The following assumption is put forth by Weinlechner: As the larger number of cases occur prior to the age of sixteen months (during the period when the relative growth of brain is most rapid), cerebral pressure will be correspondingly greater during this early age, and, therefore, he looks upon the factor as the chief determining cause of the complication after a simple fracture has occurred.

The exceptional occurrence, in a boy over twelve years old, Conner considers due to the injury being caused by a comparatively slowly-acting, crowding force of no very great amount. This explanation is hardly satisfactory; it applies equally well in cases of very young children. We find that the accident has followed the use of forceps during parturition, the force in the latter case also acting slowly and compressing the head gradually.

Diagnosis in these cases may be extremely difficult. If the fluctuating tumor be reducible, perhaps pulsate synchronously with the heart, increase in size upon expiration, coughing, or crying, and if a gap can be felt in the bone, or cerebral disturbances ensue when pressure is exerted, then the nature of the case is obvious. On the contrary, if there be no such positive signs, the doubt can only be cleared by a chemical examination of the fluid, as was done in the case of the little patient

before us this evening. "In every case, therefore, where there is a subaponeurotic tumor and a history of head injury, if rapid subsidence of the swelling does not take place, an exploratory aspiration with at least a hypodermic syringe should be made" (Conner). As to the nature of the fluid, I do not think that there can be any reasonable doubt. The chemical identity of the fluid with the cerebro-spinal liquor has been established by such competent observers as Billroth, Lucas, Weinlechner, Conner, and Jacobi.

If the external tumor pulsates, it clearly indicates a communication with the interior of the skull. Our prognosis must be guarded. The parts ought to be protected from any violence. The gravity of the case does not consist in the escape of the cerebro-spinal fluid; large quantities may be lost without any apparent evil result. Hewett refers to a case, reported by Dudley, in which it is computed that not less than two gallons escaped gradually in a comparatively short time, and yet the patient recovered. Of eleven cases of compound fracture, complicated by the escape of cerebro-spinal fluid, eight recovered. The fatal nature of the case is determined not by the loss of fluid, but by the severe lesions, the extravasation of blood, and the laceration of the brain tissue. The severe injury must be regarded as a permanent source of danger, that may at any time determine an attack of acute meningitis. The mind may be more or less affected, and a morbid condition result; the danger to life is great.

The unfortunate experience of pre-antiseptic surgery relegated this variety of injury to the large class of cases in which palliative measures only were allowed, and the treatment in consequence was restricted to the simplest measures. Internal medication is of no avail. If evidence of pressure exist, the fluid may be drawn off by means of a fine aspirating needle, discontinuing the process upon the advent of any untoward symptoms. Pressure may be applied, after the sac has been emptied, by means of adhesive plaster, silk elastic cap, etc. Simple tapping has been followed by a purulent meningitis. Free incision and the introduction of a seton have resulted fatally. Noble Smith's plan of injecting a few drops of Morton's iodo-glycerin fluid into the sac wall at intervals has

yielded excellent results in cases of meningocele, and may, perhaps, give equally good results in the variety now under discussion. A permanent cure may be accomplished by resorting to injections, following the precautions observed in spina bifida. The fatal results consequent upon the second injection of iodine in Billroth's case (though death was imminent from rupture of the sac) teaches us that such operative measures should not be attempted when a communication exists between the sac and the interior of the cranium. Under such conditions the attempt may be made to secure isolation of the tumor by means of graduated constriction or pressure. Antiseptic surgery, with its advances and brilliant achievements in cerebral surgery, may offer more favorable results in the future.

It may be suggested that, as the presence of fluid between the fragments interferes with bony union, its removal may facilitate ossification. Unfortunately, the communication existing in many cases between the exterior and interior of the cranium allows of a rapid reaccumulation and defeats our object. If operative measures are necessary in consequence of a threatened rupture of the sac or other causes, and we are certain that the communication with the interior has been obliterated, the problem is simple. Laying open the sac, dissecting it out or destroying it, and dressing the wound antiseptically will no doubt remove the deformity.

If the opening be patent the problem is more complicated, and under the strictest antisepsis the sac must be opened and the lateral ventricle drained after the skull has been trephined. That this plan is feasible is not at all improbable, for the ventricles have been opened and drained by Von Bergmann, Ayres, Keen, and others. Keen has washed out the cavity with a boric-acid solution, and has laid down admirable rules for the performance of the operation of draining the lateral ventricles. A strict adherence to the teachings of the masters of cerebral surgery may succeed in curing the false meningocele.

As to the cure or amelioration of the mental state and the paralysis? These two questions are pithily disposed of by the following quotations from Osler's lectures on cerebral palsies, etc.: We are "not likely to improve a pure paralysis, due to a hole in the brain, by making the hole bigger." Dr. J. J.

Putnam raises a more serious objection,—viz., "The existence in these long-standing cases of descending degeneration. The paralysis could not be benefited, and only exceptionally can we expect the epilepsy to be relieved."

In conclusion, I would formulate the following propositions:

1. Simple fractures of the vault in children, involving the membranes and brain, may be attended by one of two possible complications. In the one variety (*a*) we notice a cranial gap with the brain pulsating at the bottom of the opening in direct apposition with the bone. In the second (*b*) a false meningocele forms. The watery tumor may communicate with the interior of the skull, or the opening may close subsequently by bony or membranous union.

2. A false meningocele may be a primary or secondary condition. It is primary when it complicates a simple fracture; secondary, when it occurs after a compound fracture, trephining, or other operation upon the brain.

3. As a primary condition it is peculiar to children; as a secondary state it may occur in childhood or adult life.

4. If pulsation be present or pressure upon the tumor gives rise to intercranial symptoms, the communication with the interior is patent. It must not be forgotten, however, that the opening may be small or several openings exist, and their course run in a tortuous manner, so that pulsation may be absent and pressure will not give rise to intracranial symptoms.

5. The presence of a false meningocele is proof positive that the lateral ventricle has been involved.

6. The tumor may develop at once, or only after the lapse of days, weeks, and even months.

7. The unfavorable results are due to meningitis, encephalitis or lepto-meningitis.

8. The operative measures may be palliative or curative. If the communication with the ventricle has become occluded aspiration may be employed; injection of iodo-glycerin may be used, or the sac may be incised and dissected out or destroyed.

If the opening into the ventricle is still patent, aspiration may be resorted to as a temporary expedient. In case more

radical measures are required, the lateral ventricle may be drained under the strictest antisepsis.

DISCUSSION.

Dr. Fruitnight.—It appears from the cases recorded that when a meningocele has been present, it has frequently been diagnosticated as a cephalæmatoma. In this confusion of diagnoses a note of warning appears; for, inasmuch as cephalæmatoma occurs not so very infrequently, one would be very apt to make such an error in diagnosis whenever a soft, fluctuating tumor develops under the scalp, unless he bore in mind the possible occurrence of a meningocele. We should therefore be more guarded when such swellings appear, particularly if they show themselves after instrumental deliveries.

In regard to the differential diagnosis of these two conditions it seems to me that the swelling of the hæmatomas is more symmetrically globular than that of the meningocele. Furthermore, I believe that the bony ridge bounding the base of the circumference of the meningocele is more irregular and jagged in outline than that about the circumference of the hæmatoma.

A CASE OF EMPYEMA WITH EXPECTORATION OF PUS: THORACOCENTESIS.

BY J. HENRY FRUITNIGHT, M.D.,
New York.

In the latter half of the month of August and the first weeks of September, 1889, Maggie K., aged seven years and ten months, passed through an attack of illness, exhibiting a complex of symptoms which included an irregular type of fever with exacerbations, accompanied by the so-called abdominal group of symptoms, tympanites, tenderness in the right iliac fossa, and ochre-colored diarrhœa. In the course of her sickness an attack of intestinal hemorrhage also occurred. The *tout-ensemble* of her symptoms predicated the conclusion that her illness was typhoid fever.

By the middle of September she was discharged as conva-

lescent. For a period of several weeks thereafter, as the mother informs me, there was a steady gain and improvement in the child's condition generally.

About the beginning of November, however, the girl commenced to fail. The mother noticed that the child coughed, was feverish, and lost both in appetite and flesh.

About the 25th of November I was summoned to see the patient. On physical examination of the chest, I discovered the presence of an effusion in the left pleural cavity, presumably purulent. The physical signs of a pleuritis were also present, besides, the heart was crowded far over into the right thorax, and at the same time there existed a marked curvature of the spine to the right. The effusion seemed to extend up about two-thirds of the distance from apex to base. Of course dyspnœa was marked. Thoracocentesis was advised, but the parents objected, and I declined to treat the patient in any other way. On the 27th of the month I was again called, because the child had expectorated pus. When I saw her on this day she was weaker and in a less promising condition than on the previous day. She had expectorated very much pus during the night and morning, and the purulent character of the expectoration still continued. I again advised the operation and suggested a consultation. Later in the day, Dr. J. Lewis Smith saw the patient, who coincided in the opinion that an empyema had ruptured into a bronchus and through the pulmonary tissue, thus finding its way out of the chest by means of expectoration. The doctor also held out thoracocentesis as the only chance for the patient's recovery. Hereupon the assent of the parents to the operation was obtained.

Accordingly, on the following day, in the presence of my colleague, Dr. Charles E. Young, thoracocentesis was performed. In order to be positive of the location of the pus, aspiration under rigid antiseptic precautions was made at the first intercostal space, below the angle of the scapula on the affected side, which demonstrated the presence there of dirty grayish pus. A hypodermic injection of muriate of cocaine was now made over the seat of operation, which was shortly afterwards followed by a free incision an inch and a half in length. Immediately a very large volume of pus welled up out of the wound

and continued to flow freely for a considerable time. Upon its cessation a rubber drainage-tube was inserted through the wound into the pleural cavity, which was then irrigated with two quarts of a solution of the bichloride of mercury of the strength of 1 to 10,000. The wound was then dressed with ten-per-cent. moist iodoform gauze and the chest bandaged. These dressings were at first removed daily, for they became saturated with the purulent discharge from the thorax. Later on they were changed less frequently according to the copiousness of the drainage from the chest. The drainage-tube remained *in situ* until the 20th of February, when it was removed. While the tube was *in situ*, intrathoracic irrigation was made only occasionally, at first at about every fourth day, later once weekly, with the bichloride solution already alluded to. The quantity of pus drained away gradually diminished from the time of operation to the time of withdrawal of the drainage-tube, and the same is to be said in regard to the purulent expectoration, while *pari passu* there was a corresponding gain in the general health and condition of the patient. For about a week before the withdrawal of the tube there was an apparent increase of the amount of pus, and I was in fear that the empyema was getting worse, but, after careful consideration, I came to the conclusion that the tube itself was the cause of irritation, and the gradual diminution of the discharge after its removal verified the suspicion that it was the offender. It is of course understood that the appropriate medicinal and hygienic measures of treatment participated in the treatment of the case. After the removal of the tube the wound in the chest wall rapidly healed under iodoform gauze with firm bandaging and antiseptic washes repeated at stated intervals of several days. Whenever the drainage-tube was exposed and the patient coughed or cried, or made any violent expulsive effort, the pus, charged with bubbles of air, would be forced out of the free extremity of the tube, accompanied by the characteristic hissing sound of air when passing through a tubular vent. I took advantage of this phenomenon to decide when the cavity was free from pus, for when, in the last week of the presence of the tube in the chest, no bubbles of air appeared at the outlet, when the patient made such

violent expulsive efforts, I drew the inference that the thorax had been evacuated.

After having passed through such a prolonged and severe illness, the condition of the patient is to-day excellent. The patient is before you, and you will observe that there resulted scarcely any retraction of the affected half of the thorax, that there is no deviation of the spinal column, and that the collapse of lung-tissue is hardly to be appreciated, for pulmonary expansion and respiratory movement are to all intents and purposes about normal. In consequence of the contraction of the chest the cicatrix has deflected considerably to the left of the point which the incision bore in relation to the angle of the scapula when it was made.

The case offers several points for comment. First, inasmuch as the attack of empyema occurred not so very long after the attack of typhoid fever, the former may reasonably be assumed to stand in the relation of a sequela to the latter.

Secondly, the rupture through the lung and bronchus is the most interesting feature of the history, for it is not of very common experience. Indeed, authors allude to it as occurring but very occasionally, and are apt to lend a sombre tinge to the prognosis in these cases. That may have been so years ago. It seems to me that their occurrence will be even more infrequent in the future than in the past, for if the case comes early enough under observation and the diagnosis be established, thoracocentesis will have been advised and performed long before such an effort of nature to evacuate the pus from the cavity of the thorax should come to maturity. It would not have been present in this case if it had been seen and operated upon earlier in its course.

In this connection I will also say that in all probability an inflammatory state of the lung-tissue coexisted at and about the point of rupture through that viscus. Physically this could not be determined, as the intervening body of pus interfered somewhat with the transmission of pure pulmonary sounds. But as it has been demonstrated to be present in other cases of this character, it is but fair to assume that this complicating pneumonia was also present in the case in question.

Thirdly, it is always to be recommended to aspirate before making the final incision, in order to be sure that such incision will enter the pus-cavity and allow of drainage, for cases have been reported in which incision had been made, as was thought, sufficiently low to allow of drainage on the general surgical principle of cutting at the most dependent point of suppuration, and yet no pus appeared, though subsequent events in the history of the case proved that, had the incision been made at another point, drainage would have been secured. In the first volume of Transactions of this body, Dr. Meigs speaks of a case in which the incision was made too low down for the thorough drainage of the cavity, after the healing process commenced. For these reasons, then, it is preferable to aspirate first, and that not too low down before the radical incision is made.

And lastly, the case was treated in accordance with the generally expressed opinion of this Society in its discussion of this subject at its meeting in Washington in 1889,—viz., that irrigations of the pleural cavity should be done but *infrequently*, and should not be practised as a constant or routine measure of treatment.

DISCUSSION.

Dr. Carr.—One point in connection with Dr. Fruitnight's case has interested me in particular. It bears on the question raised by Dr. O'Dwyer last year as to the expansion of the thorax after opening the chest. Dr. Fruitnight noticed that, during the expiratory effort connected with cough, pus was forced from the pleural cavity out through the opening in the chest wall. This case, I think, confirms O'Dwyer's investigations reported last year.

The question of treatment in these cases without irrigation is also receiving consideration in this city. The method has been used in Boston, but not so much here. Latterly, in the service of Dr. Poore, at St. Mary's Hospital, the cavity has not been washed out at all, except in rare instances. A drainage-tube is inserted, and antiseptic dressings are applied, which are changed frequently enough to keep the child comfortable and to absorb the discharges. The children improve rapidly, and do not have the rise of temperature and somewhat tedious convalescence which is noticed after the cavity has been washed out.

DR. KOPLIK.—With regard to the case of Dr. Fruitnight, it is a very rare one, and corresponds to those of which Fraenkel, I think, has published one or two, where perforation took place into the lung with expectoration of pus, resulting in recovery. Cases of spontaneous absorption, partial or complete, of empyemas show that the pneumococcus even from the pleura can be taken up just as a consolidation of the lung from pneumonia and annihilated by the natural fluids of the system. With regard to my experiments on animals, they will be published later, but they correspond exactly to those of Fraenkel and Weichselbaum.

SOME MANIFESTATIONS OF RACHITIS NOT ALWAYS ASSOCIATED WITH SEVERE BONE CHANGES.

BY WALTER LESTER CARR, M.D.,
New York.

IN the study of disease it is customary to take severe cases and to consider the symptoms shown in a progressive order as being the regular manifestations of pathological conditions. If we find a variation from these symptoms, we still take the original classification as a standard, and view the disease as atypical or abortive. With the disorders of children, however, numerous exceptions must be made, because they are frequently derangements of nutrition which, if rectified, are not productive of serious evil or of lasting pathological changes. In infancy there is great activity of protoplasm. The function of the cells is comparatively simple, being primarily one of absorption. The lymphatic system conveys nutritive material to all parts of the body, and there is not the same physio-chemical power of digestion that is observed after dentition.

Naturally the infant should have mother's milk, and the digestive apparatus is fitted for its assimilation. The milk is a fine emulsion of fat, and as such is quickly taken up by the lymphatic- and blood-vessels through the metabolic activity of the cells covering the intestinal walls. Thus it soon enters the circulation, and is used in the economy for the necessary func-

tions of heat-production and tissue-growth. If, however, the child is not nursed, but is given some artificial or indigestible food, or if the mother's milk is deficient in any of the constituents required by the infant, the structures give evidence of the malnutrition by certain definite changes.

The action of the saliva upon starch is not, in early infancy, so powerful as it is later, and it is found that immediately after birth the parotid secretion is the only one of the salivary fluids that contains ptyaline. It is also known that before the second month the pancreatic digestion of starch is *nil*. The peptic activity of the stomach is slight and the quantity of the gastric juice small. The lymphatic vessels, however, are large, but with the growth of the digestive system they diminish in size and activity. The lymphatic vessels carry nutritive material to the tissues, and for this purpose it is necessary that they should receive a large supply of pabulum for nerves, muscles, and other growing structures.

Rachitis is a disease that a superficial observer, or one who sees children infrequently, is apt to regard as shown only by bone deformity. If this deformity is extreme, or there is delay in dentition, the signs are readily appreciated, but the early symptoms of the disordered assimilative power are not always noticed or are not ascribed to this disease.

The bone changes, though the most evident, have much less influence on the life of the child than the catarrhal complications, the muscular debility, and the neurosal liabilities.*

In this paper, which is not intended to cover all the symptoms of rachitis, but to call to your attention some changes which are often overlooked, I cannot do better than to quote the remarks of Cheadle:†

"Rickets is not to be regarded as a mere affection of the bones. This is so obvious and striking a feature of the rachitic state that it has assumed undue importance, and rickets has been in danger of being looked upon as simply a defective and perverted development of the osseous structures. . . . But it

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* "Treatment of Disease in Children." By Angel Money, Philadelphia, 1887, p. 86.

† *British Medical Journal*, November 24, 1888, p. 1145.

is something far more than this; the disease affects not only bones, but muscles and ligaments, mucous membrane and skin, the blood, and the nervous system."

Jenner* states that rickets is no more a disease of the bones than is typhoid fever a disease of the intestines.

An early and most important symptom is the derangement of the alimentary tract. This condition is a catarrhal one, and varies in intensity at the various stages of the disease and in different children, depending on the character of the food and the manner in which it is administered.

Constipation is first observed, but it is soon followed by an irregular or relaxed state of the bowels. Jacobi† believes that the bowels are confined because of weakened muscular action. The catarrh of the intestines produces an irregularity in the movements. The bowels are constipated for two or three days, then relaxed for a short time, after which they are again confined. In infants who are fed on condensed milk the fæces are usually small in quantity and show by their light color a deficiency of the biliary secretion. From some slight, existing cause, such as exposure to thermic changes, or as an alternating condition with the constipation, the movements become very loose, of bad odor, and at times are intermixed with mucus. This looseness is aggravated by improper food, and by variations in the barometer and thermometer. If severe purging comes on, the child emaciates rapidly, and has the symptoms which are incorrectly described as *cholera infantum* in many cases seen during the summer months.

When a catarrh is once induced in children improperly fed, there is considerable trouble in the attempt to regulate the diet to meet the demands of the economy. If cow's milk be selected and given to the infant without any dilution or predigestion, the weakened state of the intestines is shown in a manner that is surprising, for the child who was plump and rounded, with bowels somewhat constipated, is seen to become thinner and to have daily two or three lumpy, pasty movements, streaked with bile, often with a great deal of mucus and of bad odor. This

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* *Medical Times and Gazette*, March, 1860, p. 260.

† "System of Practical Medicine," edited by Pepper, vol. ii. p. 153.

deranged state of the bowels is much more common than would be inferred from a cursory examination, for it is only after careful questioning of the mother that it is possible to get a description of the character of the movements from day to day.

In the Babies' Shelter, where the children are received when one year old, I have noted the changes in the passages, and have become certain of the great extent of the catarrh and of the weakened muscular power of the intestinal walls. Almost all the children admitted to this institution are rachitic, having been fed at the table or from the bottle. According to the usual story of the mothers they were always well until given the fresh milk at the Shelter. Children who have had condensed milk or some starchy food, will, after admission, be confined in the bowels for a day or two, when they will pass masses of casein covered with mucus and streaked with bile. The number of the stools varies, but there are usually two or three in twenty-four hours. This state will continue for three or four days, when there will be noticeable a more uniform color of the passages and less stringy mucus. At the expiration of a fortnight, when the children are released from quarantine, there is seldom any further trouble, and the bowels act regularly. In a few instances children have had to be put on beef and mutton broths, as the diluted cow's milk seemed to occasion so much indigestion. They almost always lose in weight, but the muscles gain in firmness and the abdominal distention is lessened.

The catarrh of the intestine is, I have no doubt, in many instances the cause of the non-digestion of the fat which these children require. I have observed in this institution that the so-called fat diarrhœa is more easily induced in the children just admitted who have their intestinal walls covered by mucus than in the children who have been long enough under proper dietetic and hygienic conditions to allow the cells of the intestinal villi free to act.

Bronchitis and catarrh of laryngeal nasal membrane are common with all the cases of rickets. It is not necessary for the thorax to be misshapen or especially weakened in the bronchitis of this disease. Beading of the ribs is frequently observed without other alterations in the chest. The bronchitis is found

where there is very little thoracic deformity and early in life. "Even without any deformity the rachitical process is accompanied from an early time with bronchial and tracheal catarrh."* Such children under one year are plump, and unless carefully examined do not show their illness. The skin is white, the superficial veins are large, and the head is moist; dentition is slow, and the cough is believed by mothers to be due to the tardy appearance of the teeth. The bowels are out of order and alternate in their irregularity with the bronchitis. The physical signs will not always be the same. The child will be all "stuffed up" or have a "wheezing on the chest," as the mothers say. The severe attacks of bronchitis in debilitated children, or those who have exanthematous diseases, lead to inflammatory pulmonary changes. Bronchitis, followed by broncho-pneumonia and atelectasis, will in young children produce deformity of the thorax, and the altered configuration of the chest may be great while there is little epiphyseal thickening. The spasmodic breathing in some of the attacks of bronchitis may recur at short intervals and lead to bronchial and peribronchial changes with asthmatic seizures.

Changes in temperature, deranged stomach and bowels, or extension of a laryngitis, will cause a return of the cough and the "rattling on the chest."

The relationship of hypertrophy of the tonsils to the pigeon-breast is, I think, an association of two symptoms of the same disease.

The nervous phenomena of rickets are sources of danger against which careful physicians must guard to insure a stability of brain power in adult life.

Preyer * states that at birth no reflex is exhibited, but that the irritability of the motor nerves is not so great as it is later. With the growth of the child the reflex irritability is much increased, and until the will is developed may, from certain causes, lead to excessive action, because the controlling cells that Gowers † mentions are not powerful enough to exercise their function.

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* Jacobi, op. cit.

† "The Senses and the Will," p. 227.

‡ *London Lancet*, May 10, 1890, p. 1007.

Money * makes a strong statement when he writes that in rickets the child is doubly a child if we think of its nervous system and its liability to catarrh.

Convulsions in children are often seen at the onset of acute diseases and with deranged digestion, but the primary cause is the weakness of the ganglionic centres due to the imperfect nourishment resulting from rickets.

Gee † reported one hundred and two children who had convulsions, and of these, forty-six were rickety.

West ‡ believes most thoroughly in the influence of the rickety constitution as predisposing to convulsions.

Improper food produces an unhealthy state of the stomach and intestines, and in consequence there are cycles of constipation and diarrhœa, the one irritating the nervous system, and the other weakening it.

There is not an acute disease of childhood which has not been observed to begin with convulsions, and "teething spasms" are familiar to every old nurse. The temperament and inheritance of children vary, but the association of the rachitic malnutrition with the occurrence of convulsions in nervous children is frequently forgotten.

The period of dentition is, in the popular mind, fraught with many dangers, because physicians have failed to inform mothers of the cause of fits and other convulsive attacks, but have tacitly agreed with the parents in attributing it to teething.

Gee's § view is that the delayed dentition and the tendency to the convulsions are simultaneous concomitants of the rickety diathesis, and that in none of the cases was there any reason to believe that the teeth bore any part in the causation of the fits.

Forchheimer is free to confess that he has never seen a case of teething spasms, but that in every case of spasms it has been easy to detect a much more plausible cause.||

In the Babies' Shelter, where there are always twenty-five

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* Op. cit., p. 86.

† "St. Bartholomew's Hospital Reports," vol. iii., 1867, p. 109.

‡ "On some Disorders of the Nervous System in Childhood," p. 25.

§ "St. Bartholomew's Hospital Reports," vol. iii., 1867, p. 110.

|| ARCHIVES OF PEDIATRICS, May, 1890, p. 351.

children under five years of age, there have been visitations of acute and exanthematous diseases of all kinds. With the exception of one child, who had a convulsion soon after admission, there has not been a spasm to mark the onset of any illness nor the appearance of the teeth. These children are simply fed and have good hygienic surroundings.

The convulsive tendency in children who have slight evidence of rickets in the bones will be seen in the history of Emma S.,—Out-Patient Department, St. Mary's Free Hospital for Children,—aged one year and eight months; the sixth child. Others died from diphtheria, pertussis, bowel-trouble, and convulsions; was nursed fifteen months; dentition began at *fourteenth* month; walked when fifteen months old.

The day before she was brought to the hospital had a severe convulsion. Had been given a boiled egg, and bowels were constipated. Usually fed condensed milk, bread, and at the table. On examination, child was found to have a follicular amygdalitis. Anterior fontanelle almost closed. No special enlargement of epiphyses. Shape of chest good. Twelve teeth. Slight bronchial catarrh. Child very active.

Reported in two days, and did not show signs of throat-trouble except a little swelling. Bowels moving well.

Laryngismus stridulus is one of the evidences of rachitis best understood, but is frequently treated symptomatically and constitutional and hygienic methods of preventing a recurrence of the alarming croup are neglected. The dependence of laryngismus stridulus upon rickets is noted by all writers who have described the disease. J. Lewis Smith * states that "internal convulsions, the so-called laryngismus stridulus, or spasm of the glottis, has been observed in so large a proportion of cases that its occurrence in rachitis must be considered something more than mere coincidence."

Gee † reported fifty cases of laryngismus, of which number forty-eight were rickety. As further evidence of his belief in this association, he states that laryngismus, when treated as if

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* "Treatise on the Diseases of Infancy and Childhood," 3d Edition, p. 95.

† "St. Bartholomew's Hospital Reports," vol. iii., 1867, p. 101.

wholly dependent upon the rickets (even if it be not so in fact), ceases to be a serious disease.

Statistics show the frequency of spasm of the glottis during the period of the first dentition, the irritation of the teeth and the softened spots in the skull being believed sufficient to induce the spasm of the laryngeal muscles. The first year in rickety children may be productive of the convulsions of cranio-tabes, but it cannot be overlooked that spasmodic laryngitis is seen later in life, and that a heightened reflex,* or augmented excitability, is an essential factor in the development of spasm of the glottis. There is enough evidence of the effect of the malnutrition of rickets on the nerve-structures to show that the changes induced cause conditions of instability which weaken the mental and intellectual powers. In childhood, the reflex control being somewhat undeveloped, the laryngismus may be one of the symptoms of irritability.

Barlow and Bury † give their opinion that laryngismus stridulus is more common after nine months than before, while cranio-tabes is pre-eminently an early manifestation. Whittaker ‡ states that it is frequently absent in the most pronounced cases of rickets, and present in the lighter forms of the disease.

A case in point is that of a child seen at the Out-Door Department of Bellevue Hospital early in April. Henry B., aged three and a half years; seventh child. Nursed until two years old. Dentition began at twelve months. Then cut seven teeth in one month. Talked at the time of dentition. Head used to be hot at night and wet with perspiration. Never wanted anything over him. When two years old had a severe convulsion, which lasted, so the mother said, for seven hours. That was at the time of the appearance of the double teeth. Since then has had convulsions about once a month, usually when stomach was out of order. If he vomits, or bowels move, is always better. Two or three times has had "croup attacks."

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* "Transaction of the Association of American Physicians," vol. i., 1886; "Spasm of the Glottis in Rickets," by Jas. T. Whittaker, p. 69.

† "Cyclopædia of the Diseases of Children," vol. ii. p. 224.

‡ Loc. cit.

April 14.—Last night he awoke suddenly with a loud crowing. Face was blue, eyes were fixed, and there were contractions of fingers and toes. Under counter-irritation, etc., the attack passed off, but the boy was weak. On examination, I found that excitement would cause stridulus inspiration. The throat was somewhat congested and the right tonsil a little enlarged. The boy shows rachitic changes in the chest, long bones, and along the sutures, but not severe. Mentally the child is active but irritable. Under treatment with bromide and chloral his symptoms have been relieved, and with cod-liver oil and phosphorus he has gained in strength.

The history shows that mild rachitic symptoms, without extreme bone change, may be overlooked, and the convulsions be treated as if due to the deranged stomach and bowels.

Muscular weakness varies in severity from inability to support the head and trunk, seen early in rickets and usually in infants with bone changes, to the transient loss of power in the second year and after. In the early and severe form of weakness the infant is unable to keep up its head and the spine is badly curved. When the baby is placed in the recumbent position the cyphosis disappears. There may be some lateral curvature if the child is held on one side most of the time. The muscles are soft and flabby.

With the later development of rachitis, or with a loss of muscular power without any exhausting or wasting disease, the origin is apt to be overlooked. I have seen a number of cases where the diagnosis of poliomyelitis anterior acuta had been made after a superficial examination. The electrical reaction and progressive character of the infantile paralysis should be sufficient to prevent this error, even if the history of the case is uncertain.

Gee * believes that a child, who cannot walk at eighteen months, unless weakened by an acute disease, is either rickety or paralyzed. Simon † calls attention to the muscular weakness in children past the age of twelve or fifteen months, and

* "St. Bartholomew's Hospital Reports," vol. iv. p. 72.

† *Revue Générale de Clinique et de Thérapeutique*, June 14, 1888.

states that it is an important evidence of the existence of rickets. Brief histories of two cases which present the characteristics of the muscular inability show that this may be the most prominent symptom of the rickets.

Joseph R., aged nine months, seen at Out-Door Department, Bellevue Hospital, May 14, 1890. Child is well nourished, with skin firm and red. Muscles are flabby. He is unable to sit upright, but can partly support himself when dressed with a firm binder. Head falls forward and spine is curved in lower dorsal region; this can be relieved by supporting the baby under the arms. There is a slight lateral curvature to the left as the child usually rests on the right side. Head perspires a great deal; hair is light and thin; anterior fontanelle not open very wide; two soft spots in the occipital bone. Epiphyses are not much enlarged, and there is little change in the thorax. There are no teeth. There is some bronchitis. Bowels are somewhat confined and do not move more than once a day. The baby is given the breast five or six times a day and at night. He has also condensed milk, baked potatoes, etc. The mother looks well, but says that she vomited all through her pregnancy.

The general condition of the child is remarkably good, but the muscular weakness is extreme, and a physician, who was consulted by the mother, advised the application of a plaster-jacket.

The second case is that of Agnes L.; aged two years and three months, seen at the Out-Patient Department, St. Mary's Free Hospital for Children, April 17, 1890. Patient does not walk, as the legs have to be spread to keep her balanced; ligaments of knees and ankles are weak; muscles are flabby; fontanelles closed; bony condition good; epiphyses not enlarged; slight chest changes; right upper lateral incisor has not appeared. Child does not talk much; says "papa and mamma."

Mother says that the child was nursed until sixteen months old, but since then has been fed everything. Dentition began at eight months. Never had much perspiration of the head but was always restless at night. Never walked, and had difficulty in standing unless supported.

The girl's diet was regulated; friction over the joints and

muscles was ordered twice a day, and she was given cod-liver oil with the compound syrup of the hypophosphites. April 29, it is noted that she is stronger, and on May 15, "much improved; walks without aid."

Dentition is a physiological process that should progress without the alarming symptoms ascribed to the period of teething. In children whose first teeth do not appear until the end of a year the delayed dentition is frequently found to result from rickets. With irregular and crossed teething the influence of this disease is seldom regarded. "Irregular teething is a constant companion of maxillary rachitis, but it is also present where the latter is not well, or not at all, marked." *

The boy H. W., whose history will be narrated farther on, furnishes a good illustration of the delayed dentition of rickets. His first tooth appeared at the age of sixteen months, and at twenty-three months he had but four incisors. The two upper incisors showed before the lower. Engelsen, † in his studies on the causes of the irregular positions of the teeth, found that one-half of the irregularities in the disposition of the teeth are due to the rachitic change. The girl, Agnes L., shows one of the peculiar phases of the delayed dentition. She has no right lateral incisor in the upper jaw, although the other teeth came with fair regularity.

The teeth of rachitic children soon decay. The central incisors are often found without any enamel and are black and broken. Sometimes the molars are mere shells. This is a disfigurement that is seen every day. With the susceptible nerves of these rachitic children it is easy for them to have neuralgias and disturbances of remote organs. The interference with mastication will continue the catarrh of the stomach, and the child will be still further weakened.

Here, then, is one of neglected symptoms of rickets entailing suffering for a lifetime and inducing derangements that may become permanent.

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* Jacobi, op. cit., p. 151.

† ARCHIVES OF PEDIATRICS, December, 1888, p. 758, from *Jahrbuch f. Kinderh.*, xxviii. 2.

Excessive perspiration of the head and upper part of the chest is a symptom of rachitis that is frequently ascribed to weakness. This association is not disadvantageous in treatment, for it leads to the giving of proper attention to dietetic and tonic management.

The perspiration is most severe when the infant is asleep. The occiput, neck, and forehead are constantly moist with the transuded fluid. Sometimes there is so much perspiration that great drops stand on the forehead and run over the face and neck. Sudamina and miliaria are produced by the moisture. The hair is soft and fine, except over the occiput where the surface is denuded, or there is only a downy growth.

Nellie L., aged thirteen months, was admitted to the Babies' Shelter. She could not stand; had a chalky complexion and soft muscles. Bones not much enlarged at epiphyses. No cranio-tabes; anterior fontanelle wide open; head denuded of hair over the occiput so that it looked as if it had been shaved. Great perspiration when asleep. Learned from the mother that the child had been fed on condensed milk ever since the first month. Always restless at night and never liked clothing over her. Dentition began at nine months; never sat up; was always a "wise child." This girl gave a great deal of trouble because of catarrh of the intestines, but under proper treatment she gained in strength so that she slept well, the perspiration ceased, and the hair grew thick. Muscular strength increased rapidly.

Facial eczema is a lesion of the skin which, if not always the result of the deranged nutrition of rachitis, is so frequently associated with it that its presence should lead the physician to make a careful examination of the bony structures to determine the existence of changes in the epiphyses. The eczema is most often seen on fat, lymphatic children, and in my experience is usually observed in those who are given condensed milk, artificial food, or who are fed indiscriminately at the table. Its appearance at the period of dentition has led physicians to regard the teeth as the cause of the irritation of the cutaneous surface.

"It is altogether too much the custom to refer skin diseases,

as well as other affections in teething children, to the irritation of dentition alone." *

Niemeyer † believes eczema to be the analogue of catarrh. In the rachitic state there is an obstructed venous circulation due to the changes in the mucous surface of the respiratory passages, to the imperfect oxidation of the improper food material, and to the hydræmia. The lymphatic circulation is deranged, and the skin of the face and head is easily irritated. The bowels of the children who have eczema are constipated or irregular in action, and this is another source of disturbance.

This eczema is commonly observed over the malar prominences and the cheeks. Generally it is of the moist variety, but it may be dry and scaly. Another situation for it is back of the ears, where it is almost always moist. In children whose constitutional condition is much weakened from poor hygiene and diet, slight irritation of any kind will cause the eczema to spread. Enlarged glands are observed in debilitated children. These increase rapidly in size and with suppurative cutaneous lesions often break down.

The destructive tendency of this severe eczema will be readily appreciated in the brief history of a case which came under my care a few months ago at the Out-Patient Department, St. Mary's Free Hospital for Children.

Harry W., aged twenty months. Never nursed, but fed on condensed milk until seven months old. Dentition began at *eighteen* months, and now has four incisor teeth. Walked when sixteen months of age. Anterior fontanelle open. Eczema of the face, especially on the right side. Large lymphatic glands over parotid region. The gland suppurated, and the abscess had to be opened. Eczema disappeared.

Two months after this I noted that the anterior fontanelle had closed, but that the child had no more teeth. Slight laryngeal and bronchial catarrh. Bowels somewhat irregular. The treatment was hygienic and cod-liver oil.

The photograph of an Italian child, Designi, aged nine months, who came to the Out-Door Department of Bellevue

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* "Diseases of Children," Meigs and Pepper, 7th Edition, p. 934.

† "Practical Medicine," vol. ii. p. 467.

Hospital a few weeks ago, shows plainly how extensive eczema may be in a child who is nursed but who gives all the signs of rickets.

The few histories presented show that there are weaknesses of brain-structure and tissue-changes of various kinds that are undoubtedly due to the non-recognition of the fact that rickets is something more than a disease of the bones. From these histories are drawn the following conclusions:

Rachitis is a disease of nutrition.

It is manifested in early life because that is the period of physiological growth, and anything that prevents or retards food-assimilation may cause the disease.

The chemical changes produced by the malnutrition are not fully understood, but it is well known that the deprivation of fats and albuminoids has a great deal to do with the development of rickets.

The symptoms of rachitis are often nothing more than the catarrhs of the alimentary and respiratory tracts, delayed dentition, muscular weakness, and nervous irritability.

Under proper hygienic and dietetic conditions these symptoms of incipient rachitis disappear, because with an increased glandular, secretory activity the function of the lymphatic system is *pari passu* diminished.

A CASE OF TRANSPOSITION OF THE AORTA AND PULMONARY ARTERY, WITH PATENT FORAMEN OVALE: DEATH AT TEN YEARS OF AGE.

BY JOHN DORNING, M.D.,

New York City.

T. H. first came under observation May 14, 1883. He was then twenty-three months old. Both parents healthy; never had rheumatism. Maternal ancestors suffered from rheumatism. One other child, three years old, healthy (mother has had three children since, all healthy). The patient when born was

blue, but breathed all right; was nursed until fourteen months old. Suffered with constipation while nursing, but bowels became regular after weaning. Had malarial fever when twenty months old. (Lived in New Jersey.) Urine has been of a dark color and strong odor. Mother thinks child is no more blue now than when born. When he is cold or has a chill, blueness is more marked. Eats and sleeps well.

Examination by Dr. Ripley and myself showed marked general cyanosis, lividity of lips and tongue, dilatation of superficial veins, clubbing of fingers and toes, non-closure of anterior fontanelle, rachitic conformation of chest, and slight œdema over tibiæ. There is some bulging of præcordial region; increased area of cardiac impulse; heart's beat forcible but regular; apex beat beneath left nipple in sixth interspace; loud systolic bruit heard towards the base of the heart, with maximum intensity in third interspace a little to left of sternum. It is heard behind, at lower angle of scapula, but is not transmitted around the side of the chest, nor is it audible in the vessels of the neck. Numerous dry and moist râles in chest; respirations, 40. Prescribed digitalis, cod-liver oil, and quinine.

May 22, 1883.—Has severe attack of follicular tonsillitis.

June 5, 1883.—There seems to be some general improvement; cyanosis about the same; râles have disappeared, otherwise no change in physical signs; respirations, 40.

June 27, 1883.—Has had an attack of measles since last seen; murmur not so loud.

July 10, 1883.—Has had diarrhœa for a few days which has prostrated him very much.

December 11, 1883.—Cardiac murmur quite loud; no change in physical signs; general improvement; cyanosis not so intense as when first seen.

October 4, 1884.—During past summer had catarrh of middle ear; continues to improve; can walk some with the aid of braces on legs; suffers from occasional attacks of indigestion; dyspnœa and increase of cyanosis on even moderate exertion.

December 13, 1884.—Had two attacks of syncope yesterday without any apparent cause. To-day, pulse, 120, regular; respirations 30.

February 19, 1885.—Mother reports that patient has been

in "splendid condition" since last visit; no attacks of syncope; physical signs the same; respirations, 30; pulse, 120.

September 8, 1885.—Has felt very well all spring and summer; brought to-day ailing with an attack of bronchitis; coughing causes increase in cyanosis and much prostration.

September 22, 1885.—Bronchitis well; cyanosis less marked; anterior fontanelle closed.

During July and August suffered with a moderately severe attack of pertussis without any complications.

December 7, 1887.—Compared with a few years ago there is a decided decrease in the cyanosis. The clubbing of fingers and toes not so prominent; cardiac murmur diminished in intensity and hardly perceptible behind. Tries to join other children in play, but soon tires and finds breathing difficult.

December 5, 1888.—"Has been in excellent health until last week;" has had two attacks of bronchitis, for which his mother had his former prescription renewed. For the past week has complained of shoes being too tight; two days ago face became quite puffed; to-day he is more pale and cyanotic than usual; face is not swollen, but there is some œdema below knees; coughs quite a little; great dyspnœa on slight exertion. There are sonorous, sibilant, and mucous râles all over chest; rude respiration on right side behind; temperature normal; heart acting tumultuously but regular in rhythm; murmur more perceptible over body of heart than at the base; is not passing a great deal of urine; a specimen examined showed a specific gravity 1012 and a good trace of albumen. Prescribed digitalis, strophanthus, and citrate of potassa.

December 12, 1888.—Much improved; cough almost gone.

December 30, 1888.—No cough; no œdema.

October 15, 1889.—Has been doing well all along, with exception of occasional attacks of bronchitis, for which his old prescription (Mist. Glycyrrhiz. Co. and digitalis) was used.

December 2, 1889.—This morning was seized with a severe pain in region of the heart; felt that he was dying; bid parents and brothers and sisters good-by; his mother said he turned perfectly white when the attack came on; his lips became blanched, eyes rolled up, and his face assumed an anxious look. The father, who is an intelligent man, tried to feel his pulse;

he said it failed to beat for some seconds, then began to beat slowly and intermittently. When I saw him, three hours later, he was very pale, quite cyanotic, and somewhat agitated. Pulse, 58, irregular and intermittent; respirations, 30. There is a humming sound accentuated with the systole diffused all over the chest, but most intense over body of heart near the base. No blowing murmur could be detected; gave small dose of morphine to allay agitation, and also for its action on the heart; ordered repeated doses of digitalis and strophanthus; examination of urine showed eight per cent. albumen; no casts.

December 4, 1889.—Father reports that child is quite well again; urine contains trace of albumen.

December 9, 1889.—Well and playful all day; was out in his wagon in afternoon. At 6 P.M. had just finished his supper of bread and milk, when he complained of feeling sick and called for a glass of water. As the glass was handed to him "his eyes rolled up, his jaw stiffened, and he fell back dead."

On post-mortem examination of the heart the organ was found to be larger than the adult heart.

Right ventricle very much hypertrophied.

Right auricle greatly dilated.

Left side of heart does not show much hypertrophic change.

Valves exhibit nothing abnormal.

Coronary arteries large and patulous.

Foramen ovale patent.

No interventricular communication.

Aorta arises from right ventricle.

Pulmonary artery originates from left ventricle.

The absence of a carefully performed autopsy, which the circumstances of the case did not permit, prevents us from drawing the valuable deductions which must undoubtedly be associated with such a case. There are, however, two interesting points which may be mentioned: First, the long duration of life. Most of these cases are said to die within a few weeks after birth. Where there is also an interventricular communication the chances for a longer period of existence are better.

In this case the patent foramen ovale, which was a secondary complication, acted unquestionably as a safety-valve, allowing a commingling of the two blood-currents.

Second, the fact that the patient did not succumb to the attack of pertussis, which even in a healthy child would have involved some temporary disturbance of the circulation.

The treatment consisted of the administration of cod-liver oil, alone or combined with the hypophosphites and iron almost continuously for the first few years. After that they were given for a few months each year. Digitalis was prescribed according to indications.

JUN 16 1892

In regard to the cause of this anomaly, I think Rokitansky gives the most satisfactory explanation. He attributes it to a premature cessation of the rotation of the truncus arteriosus communis, probably due to its fixations by a pericardial inflammatory adhesion.

THE ETIOLOGY OF EMPYEMA IN CHILDREN.

BY HENRY KOPLIK, M.D.,
New York.

I AM certain that you will all agree with me when I say that the subject of the etiology of empyema in childhood is one of the first importance. This theme and its kindred factors are at the present time subjects of the most sincere and painstaking investigation all over the world. The present communication is only a preliminary one to the more complete paper to be published at some future day. In it the special aim is to inquire into the etiology of empyema in infancy and childhood from the stand-point of modern bacteriology. In infancy and childhood the factors of predisposition and exciting cause are modified in their action by the nature of the material dealt with, a growing, developing organism. This is seen particularly well in the chest, where severe processes are borne with a resistance and impunity not to be expected in the adult. We know that in practice these conditions will vary the prognosis. In the disease empyema, it is the etiology which explains in part why the treatment of the disease is more satisfactory in childhood than in the adult. In studying the disease we must revert constantly to the adult subject,

and I confess that when these studies were first begun such reference to the adult was obligatory, for none of the works extant treat of the disease in childhood in a satisfactory manner. I found in the course of my work certain similarities between the bacteriological results as published in the adult and in childhood tending to uphold in important points the identity in the pathology of the affection as common to the child subject and the adult. A brief *résumé* of the investigations in the field is as follows: The most complete series of observations upon empyemas was published by A. Fraenkel (*Ueber die bakterioscopische Untersuch eiterige Ergüsse Charité Annalen*, 1888, p. 14). He had published fragmentary communications upon the same subject at a much earlier day, anticipating Weichselbaum, who, as early as 1886, appeared with a paper (*Wiener Jahrbücher*) confirming the most important views put forth by Fraenkel. Previous to this, the notices in the literature of bacterioscopic work were imperfect, but they gradually led up to the more complete investigations to be detailed. Flesch and Vaillard (*Archives de Physiol. normale et pathol.*, 1886, p. 162), as also Landouzy, doubt the possibility of a genuine sero-fibrinous pleurisy as the result of exposure to cold. According to these authors all pleurisies whose etiology is not evident are the result of an expression of a localized tuberculosis. The exposure to cold only plays a predisposing *rôle* in the etiology. In sero-fibrinous pleurisies the diagnosis is more difficult because our methods of investigation yield a negative result in most cases. We are thus allowed a mere surmise upon their true character. Ehrlich (*Beiträge zur Ætiol, etc., Pleurit Ergüsse Charité Annalen*, 1882, p. 207) investigated with stainings the bacterial character of fluids obtained from the chest in forty-five cases of pleurisy. Of these, nine cases were tubercular, twenty simple pleurisy, six carcinomatous, and nine empyemas of various kinds. A negative result by cover-glass stain does not exclude tuberculosis. In nine cases the sputa of which showed tubercle bacilli, the bacilli were found in the pleuritic exudate in only two cases. Ehrlich thinks that the bacilli became entrapped in the fibrin masses of the pleuritic exudate, and thus escaped detection in the cover-glass. A. Fraenkel does not reject the possibility

of a sero-fibrinous pleurisy as the result of an exposure to cold. In these cases the vital forces are so reduced by cold as to enable micro-organisms situated in the subpleural tissues to become potent. Cold may in this way be an important predisposing factor in the causation of pleurisy. In this class of cases, where micro-organisms have not been isolated, a certain percentage have proven, upon autopsy, to be tubercular. The etiology of the remainder is still a matter of speculation. In some sero-fibrinous pleurisies there has been a positive result, immense quantities of streptococci having been found in one case (Fraenkel). In others, where micro-organisms have been present, the exudate became purulent subsequently. Fraenkel makes three principal groups of his cases of empyema. This grouping is based upon the bacteriological results. The first group yielded streptococcus pyogenes upon investigation of the pleuritic exudate. These organisms may have been derived from the lung, a previous pneumonia (Weichselbaum), or there may not have been any preceding pneumonia. Such empyemas may (?) result from a traumatism without perforation of the chest, the trauma acting, as stated above, as a predisposing cause. The second group includes all those empyemas which result from pneumonia, post-pneumonic or concomitant with pneumonia. In all of these cases the diplococcus pneumoniæ (Fraenkel) is found in pure forms in the pleuritic exudate. This micro-organism is not only capable of producing suppuration, but in these cases suppuration is maintained by the closed pleural cavity, the presence of blood-vessels, and a different nutritive medium than in the artificial culture, where these micro-organisms soon lose their virulence; Fraenkel's cases followed or complicated fibrinous pneumonia. The third group is that including the tubercular empyemas. A fourth group of cases includes those empyemas which complicate some extra pleural focus of suppuration, pyæmic cases. The above cases in which the pneumococcus was found followed lobar pneumonia. Inasmuch as in children the processes in the lung, when pneumonia is present, are of a broncho-pneumonic character in most cases below a certain age, it will be necessary here to anticipate by citing the researches of Weichselbaum, who found that the pneumococcus of Fraenkel was also an

important etiological factor in broncho-pneumonia, lobular pneumonia (*Ueber die Ætiol der acuten Lungen und Rippenfel Entzündung*). The division of pneumonia into lobar and lobular has an anatomical but not an etiological basis. Both varieties of pneumonia may be caused by the same micro-organism. Weichselbaum also examined cases of pleuritis, and found not only the diplococcus pneumoniæ, but also the streptococcus pneumoniæ or pyogenes and the staphylococcus pyogenes aureus. I will, in addition, only refer to the recent discourses of Von Ziemssen (*Klin. Vorträge*) and Liebermeister (*Deutsche Medicinische Wochenschrift*, Nos. 10, 11, 12, 13, 1890), as excellent *résumés* of our present knowledge in the pathology and therapy of the pleurisies and empyemas. My own material is made up of cases obtained from my dispensary and private practice, and I have also studied the disease in the wards of the Mount Sinai Hospital, New York. I wish to sincerely thank Dr. Barnim Scharlan, who has charge of the children's wards at this hospital, for the very liberal manner in which he has placed his cases at my disposal; without access to such clinical material the work which I present would be less satisfactory and simply fragmentary. The experimental work which forms the basis of my studies was done in the Carnegie Laboratory of New York. I am indebted to Dr. E. K. Dunham, of this institution, for many professional courtesies. The micro-photographs were prepared from my own preparations, and are the work of Dr. R. H. Cunningham, house physician to the Mount Sinai Hospital. The apparatus used was the most improved Zeiss, and the beauty of the work speaks for itself. I am indebted to the doctor for his patience and enthusiasm.

Methods of investigation.—In making the following studies I have adhered closely to the methods now so well known by all the investigators of the Koch school. The chest of the child was first carefully cleansed, a carefully sterilized needle and syringe was then introduced, and a small quantity of pus withdrawn, placed in a sterilized tube, and taken to the laboratory for immediate investigation. A new syringe was used in each case for reasons which will appear evident to all. These hypodermic syringes, after they have been once the receptacle of pus, must be difficult to thoroughly clean, and to do away

with this objection I never used a syringe twice, but discarded the old syringes. The new syringe, after having been carefully prepared by washing with sublimate, alcohol, ether, and sterile-distilled water, was attached to needles sterilized by dry heat in the usual way. The pus was immediately sown upon plates and tubes, and crude cover-glasses were also prepared and stainings made. When pure cultures were obtained from the agar or bouillon in the case of the diplococcus pneumonia, or from agar, gelatin, and bouillon in case of streptococci or staphylococci, they were used for experimental work. Or the pus was, according to Weichselbaum's method, inoculated into agar tubes, and when sufficient growth was attained new tubes and plates were made, the latter to test the purity of cultures. The above was carefully carried out in each case. The media used were blood serum, agar-agar, gelatin, glycerin-agar bouillon, and potato. I found that the most uniform results were obtained with the agar invented by Weichselbaum; it has the requisite consistency and moisture. The pure cultures were suspended in sterile-distilled water and injected into animals, or the pure bouillon culture was injected. Rabbits, guinea-pigs, and rats were the animals used. The cover-glasses which had been prepared with crude pus were stained with methyl violet or with gentian violet by the Gram method. They were stained also for tubercle bacilli. I have determined to report to you my results in twelve cases of empyema, and I will divide them, as Fraenkel, into groups.

Group I.—This group includes those cases in which the bacterioscopic results are not uniform, and in which the micro-organisms found are not diagnostic. The streptococcus pyogenes or the staphylococcus pyogenes aureus were found. I have three such cases to report. Thus far they occurred in children aged seven years (female), eleven months (male), and twelve years (male), respectively. In all of these cases the history, prior to and during illness, failed to elicit any clinical possibility of tuberculosis. In all, the bacterioscopic results were as above. I leave the clinical histories of all the cases of this paper for future publication. In two cases the streptococcus or chaincoccus was found which in every way as to growth and action corresponds to the streptococcus pyogenes. In the third

PLATE I.

(MICRO-PHOTOGRAPH.)

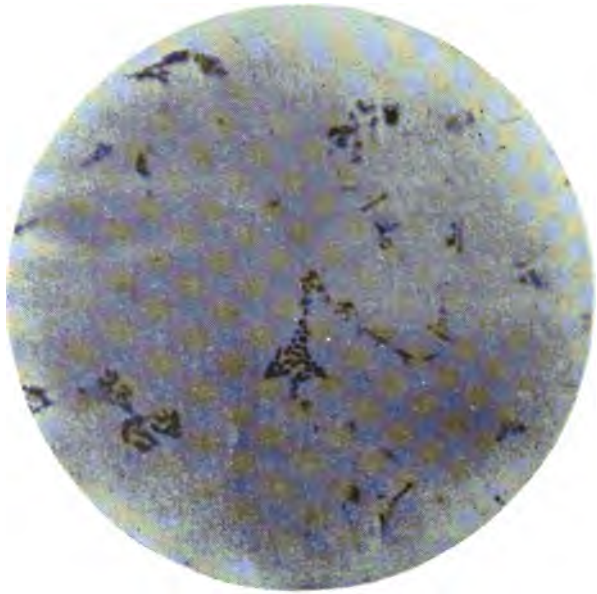
1. Diplococcus pneumoniæ in the crude pus of Group II. spread upon a cover-glass and stained with gentian violet; shows the capsule; Zeiss apochromatic lens, projection ocular No. 2; × 1000; zircon light.

PLATE II.

(MICRO-PHOTOGRAPH.)

2. Diplococci pneumoniæ in the crude pus of empyemas of Group II. Shows capsule, diplococci single and in chains, also the "candle-flame shape." Cover-glass specimen; gentian violet; Zeiss apochromatic lens, projection ocular No. 2; × 1000; zircon light.

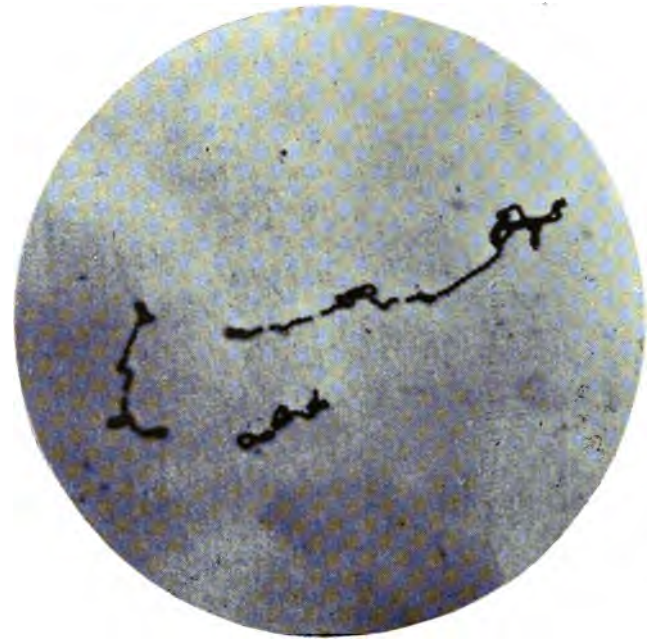
PLATE III.



(MICRO-PHOTOGRAPH.)

3. Pure culture of diplococcus pneumoniæ obtained from the pus of a case of empyema in Group II. Agar culture; Gram stain; Zeiss apochromatic lens, projection ocular No. 4; × 1000; zircon light.

PLATE IV.



(MICRO-PHOTOGRAPH.)

4. Pure culture of streptococcus pyogenes obtained from the pus of a case of empyema in Group I. Bouillon culture; cover-glass specimen; gentian violet stain; Zeiss lens as previous specimen; × 1000; zircon light.

case, a child, aged eleven months, the staphylococcus was found which in every way corresponds to the staphylococcus pyogenes aureus. The above group finds its exact counterpart in the group of similar cases investigated by Fraenkel in the adult. Eliminating the presence of tuberculosis, we are still in doubt as to the exact etiology of these cases; we might with Fraenkel suppose that they could have complicated a pneumonia, for Weichselbaum proved that in pneumonia there were present (as mixed infections) both the streptococcus pyogenes and the staphylococcus pyogenes aureus. Again, these empyemas could arise spontaneously, as explained above, with the predisposing aid of exposure and cold or a slight traumatism, the above micro-organisms being present in the subpleural tissues. In none of my cases was a traumatism mentioned in the history. On the whole, it seems uncertain as to how these empyemas originate. The organisms found, as you see, are not characteristic.

Group II.—This group includes those cases in which I have been able to establish the presence of the pneumococcus of Fraenkel and Weichselbaum in the purulent exudate. This organism was found in pure form and uncontaminated in all the cases of this group. I was perhaps fortunate in working with a simple purulent exudate and obtaining my specimen pure and uncontaminated. In all the cases the crude pus spread upon cover-glasses and stained showed the capsulecoccus singly or in pairs or chains, and the lancet-shapes could be beautifully seen. These diplococci could be well stained by the Gram method. The pure cultures with Weichselbaum agar were characteristic, and I leave their description for a more lengthy paper. There are seven cases to report in this group, six males and one female child, aged five years, twelve months, two and a half years, three and a half years, two years, and two and a quarter years, respectively. I wish to direct particular notice to two cases of this group. In both of these cases the effusion, when drawn from the chest with the hypodermic syringe, was at first clear and serous, in one case being devoid even of fibrin flocculi. In both cases, however, the diplococcus pneumonia was isolated in pure culture, and its virulence established upon animals. This micro-organism could

also be stained by spreading a drop of the crude exudate upon cover-glasses. If a drop of this exudate were placed under the microscope, the diplococcus could be seen, as also a few lymphoid cells. These cases subsequently became pronounced empyemas, the serous having turned into a purulent exudate. This tends to support the assertion of Fraenkel that when an exudate, serous in character, contains streptococci, it can be predicted that it will shortly become markedly purulent. The same could be stated of the diplococcus pneumoniæ, for we know of its established capabilities to produce suppuration. The above also shows that the character of a serous exudate cannot be established until examined bacteriologically. In this way we can make a differential diagnosis between those exudates which, like the above, are acute in character and those which are serous, and contain no micro-organisms and fail to give any results with our media, and the majority of which, in the *adult* at least, are tubercular. The presence of a serous fluid in the hypodermic may be of little use in proving the purulent character of the fluid in the chest as far as gross appearance is concerned. It is well known that the pus of empyema, even in the chest, has a tendency to separate into two portions; that portion in the dependent part of the chest may contain most of the lymphoid cells and be markedly purulent to the macroscopic examination, while the upper stratum which we have aspirated may be serous. The clinical diagnosis of pleurisy with serous effusion is only temporary at best, and we must be always on the lookout for pus, especially if the serous fluid aspirated contains streptococci or diplococci. It has been customary formerly to assume that if a fluid has been serous at the first aspiration and subsequently became purulent, it had been contaminated from without by the hypodermic. If such effusions had been carefully examined, I am sure micro-organisms would have been established at the very outset. When a serous exudate has from the very first been proven free from organisms and then subsequently turns purulent, then we may think of some contamination or mixed infection. When the bacterioscopic result is as positive as in the cases of this group, I think it is not necessary to prove the clinical presence of a pneumonia in order to trace the

origin of the empyema. The isolated presence of such a virulent micro-organism as the diplococcus is sufficient proof as to the origin of such inflammatory processes of the pleura. As stated above, the cultures of all the cases in this group were inoculated upon animals with results identical with those of Fraenkel and Weichselbaum. I shall publish them in the near future.

GROUP III.—Empyemas occurring in tubercular subjects, as far as investigations in the adult teach us, may be encapsuled and localized to narrow limits by adhesions in the chest, or they may be diffused over the whole pleural surface. They may complicate a tubercular condition of the lungs, or they may be present when there is no pulmonary tuberculosis. The general result is not changed by these conditions, the prognosis is always bad and conditional: a partial recovery is the result in the most favorable cases. The tubercular cases in the adult are the most unsatisfactory to treat. Though we relieve certain symptoms, other conditions are superimposed by our treatment which are not less harassing to the patient than were the symptoms of the original condition. In adults the bacteriological investigations may (Fraenkel) yield an absolutely negative result. Our inoculations of the pus from the pleural cavity upon various media yields us nothing, and thus far experiments upon animals have been equally unsuccessful. This may be because our present methods and media fail to reach these cases; or, better still, because, though the tubercle bacilli may exist in the pleural adhesions and the tubercle tissue of the adhesions and thickened pleura, they may be present in such small numbers in the exudate, at least in that withdrawn from the chest, as to fail to grow when artificially cultivated. When a case, upon careful examination of the pus, gives an absolutely negative result, we are justified in assuming the possibility of a tuberculosis. In most of these cases where post-mortem has been made tuberculosis has been established. The second class of cases of a tubercular nature are those in which the sputa of the patient and the pus of the empyema show tubercle bacilli, both by stain and culture. Lastly, streptococci have in some cases been found to contaminate the pus in some of these

tubercular cases (Fraenkel). In this last set of cases a contamination is assumed from the subpleural tissues or the lung. In children, as far as I know, no parallel investigations to the above are on record. I have only one case to report, a boy of eight years, in whom the empyema is tubercular. In this case tubercle bacilli were found in the pus of the chest, but it was contaminated by the presence of streptococcus pyogenes. This corresponds to an adult case of Fraenkel's. This patient is still alive, and, though walking about, carries a large suppurating cavity in the chest, which refuses to close in spite of the enormous contraction of the chest wall and extensive resection of numerous ribs. There are no signs of tuberculosis discoverable in the healthy lung. It was not possible to obtain the sputa for examination. Thus far my experiments upon animals with the pus have been negative, the results being clouded by the presence of streptococci. It is not at all impossible for a tubercular empyema to make, if localized, an apparent temporary recovery; but whether such recoveries become permanent it is at present impossible to say. It is also problematic in these cases as to what is the real focus of trouble; why should a tubercular area in the lung, for a long time dormant, suddenly cause an empyema? We could here also invoke the predisposing exposure or traumatism. Tubercular empyemas are the most difficult to diagnosticate in some instances during the life of the patient. In children it is not always possible to establish a tuberculosis of the lung by physical exploration; the sputa is also difficult to obtain. These little patients have been so harrowed by the disease and its results, and the presence of paraphernalia of the ward is so associated in their minds with suffering, that when a bottle or spit-cup is placed before them they resist all attempts to obtain a specimen of sputa.

Group IV.—The last group of empyemas in children belongs to that class of cases in which we can, with a degree of probability, point to a focus of suppuration situated outside the chest as the possible source of infection. These cases include pyæmic infections, and correspond to that variety of empyemas which, in the adult, are found complicating puerperal cases, or cases with retropharyngeal abscess or perito-

nitis (Fraenkel). The case which I desire to place in this group occurred in a child aged four months, breast-fed, which, for two weeks previous to the chest-trouble, had been suffering from a deep burrowing abscess on one foot. Just before the appearance of this abscess the infant had been vaccinated, and at the time of consultation for the chest-trouble the vaccine pustule looked quite angry. The pus, withdrawn with the usual precautions from the chest in this case, contained streptococcus pyogenes, which, upon inoculation, proved virulent in action. An animal inoculated with this pure culture died with multiple abscess of the liver and lung, general jaundice, and a large soft spleen. This case proved fatal in two days after pus was established in the chest, in spite of operation, dying with all symptoms of pyæmic infection. No autopsy was permitted.

The conclusion to be derived from the above is a forcible one, tending to show what a large proportion of empyemas in children follow or complicate processes in the lung of an acute character. With early and efficient treatment we can look all these cases hopefully in the face. Even those whose etiology is uncertain do not hold out such a bad prognosis to the patient. The tubercular and pyæmic cases are the stumbling stones of pediatric practice.

DISCUSSION.

Dr. Booker, of Baltimore.—During the last six or eight weeks we have had an unusually large number of cases of empyema among the children at the Johns Hopkins Dispensary, having had five cases within that time, and Dr. Shaw has been making some investigations from a bacteriological stand-point.

The president then called on Dr. Shaw, of Baltimore, who said,—

I may state some of the results of the investigation, as they bear a close relation to the admirable paper just read. It is my regret to say that no examination was made of the pus of the first case. In the remaining four the pneumococcus was found on each occasion. The pus from two of these was inoculated in each case into a rabbit and a mouse, with the results that the pneumococcus was obtained in a pure culture. The mouse of the first case died on the fourth day, and the

autopsy showed all of the organs to be infected with the micro-organism as also the blood, but the results on the rabbit were frustrated, owing to the fact that the needle of the syringe perforated the intestine from which a peritonitis was set up, in the fluid of which the colon bacterium was found. I may also say that the pneumococcus was likewise obtained, but no value was attached to the experiment.

In the second series of inoculation the rabbit died on the third day, with marked evidence of infection in all of the viscera as before, and the pneumococcus was again obtained in pure culture. The mouse lived for some time after, so no value was attached to the autopsy.

In the pus of all examined the micro-organism was in a form we have never seen it before, being in chains of from four to seven in number, and surrounded by a continuous capsule. Some of these had peculiar hooked ends. I might say that it was not obtained in this form from the animals inoculated.

DACTYLITIS IN CHILDREN.*

BY LEONARD S. RAU, M.D.,

Attending Physician Out-Door Department, Diseases of Children, Bellevue Hospital, etc.

GEORGE H., aged two and three-quarter years, was brought to my class on the 10th of April, 1890, his mother giving the following history:

The child had been well since birth; labor having been normal; first tooth appearing when one year old; anterior fontanelle closed at fifteen months. Began to walk and talk at the usual age. Five weeks ago she noticed a swelling of the first phalanx of the index-finger of the left-hand, this causing only a slight amount of pain. She believed that her husband had struck the child with a hammer on this finger, and as the swelling kept increasing and caused the child some pain she brought him to the dispensary, thinking the finger must have been broken.

The photograph (Fig. 1) shows the appearance of the finger better than it can be described. It is, however, to be regretted that this could not have been taken earlier, for at this time,

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* Read by title.

FIG. 1.—SHOWING ENLARGEMENT ON INDEX FINGER.

FIG. 2.—SHOWING CURVATURE OF THE SPINE.

namely three weeks after the child began treatment, the swelling has diminished very much. This swelling and hardness was found to exist more on the dorsal than on the palmar surface. There existed at no time any discoloration of the overlying skin; a slight crepitation could be elicited on manipulating the finger. After questioning the mother carefully as to previous history, she acknowledged that before the child was born (a few months) her husband had had some venereal trouble, but she did not know the nature of the trouble, and is positive that she has never been infected. The child showed no other manifestations of disease when examined by me for the first time, except that he appeared to be poorly nourished and was pale and emaciated. The case was diagnosticated as one of strumous dactylitis, and the child was placed upon the following treatment:

℞ Ol. morrhuæ, ℥vi;
Syr. calcis lactophos.,
Liq. calcis, āā ℥iii. M.
Sig.—A teaspoonful *t. i. d.*

This mixture being very extensively used in scrofulous children in our department and with the most gratifying results. The mother was instructed to massage the finger twice daily, rubbing it with unguentum hydrargyri, thus giving the child the benefit of the doubt as regards the possibility of the disease being of a syphilitic origin.

The child remained away from the clinic for over two weeks, and on returning was found to be suffering from an enterocolitis, which was due to an error in diet. This was at once corrected. The mother has also noticed during these past two weeks that a swelling has appeared along the spine between the scapulæ (Fig. 2); there appears to be a beginning anteroposterior curvature. Within a few days there has also been a purulent discharge from the left ear. The swelling in the finger has diminished and now causes the child no pain whatsoever.

When last seen (May 27) the child's condition was much improved. He has gained in strength and weight, and the swelling on the finger is only slight. The same treatment is still continued, though not as regularly as might be desired,

the mother being very ignorant and does not appreciate the importance of carrying out the directions.

I have gone into the history and progress of this case at considerable length, because I find, in looking up the literature of this subject, that there exists considerable diversity of opinion in regard to dactylitis in children, and that the strumous form particularly does not seem to be well known.

The disease was first brought to the notice of the profession by Chassaignac* in 1859, but the subject was not made clear until the publication of R. W. Taylor's† excellent paper in 1871.

There appears to be two prime etiological factors in this disease, one a strumous diathesis, the other syphilis. The latter form is by far the more common; in fact, most authorities entirely ignore the strumous variety; and Taylor, in the article just cited, says, "The tendency of the so-called strumous inflammation to localize itself in bone rich in cancellous tissue, particularly those of the carpus and tarsus and the expanded extremities of long bones, renders it probable that it rarely if ever attacks the phalanges." That such cases do exist, however, seems beyond a doubt, as shown in Professor J. Lewis Smith's case,‡ described in his work on diseases of children. Henoch§ also gives the histories of several cases, calling the disease in this form pædathrocæ, and I think that the subsequent history of my case entitles it to be placed under this same category. When the disease is of a syphilitic origin it is almost always hereditary (very rarely acquired, and then usually in adults) and makes its appearance in the first few months after birth, whereas the strumous variety does not appear until the close of the first or during the second year. The phalanges of the fingers and of the toes may be affected, the fingers being the seat much more frequently than the toes, and Henoch claims never to have seen a case occurring in the

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* Chassaignac, "Clinique Europeenne," 1859, p. 238.

† R. W. Taylor, *American Journal of Syphilis and Dermatology*, January, 1871.

‡ J. Lewis Smith, "The Diseases of Infancy and Childhood," 1886, p. 139.

§ Henoch, "Vorlesungen über Kinderkrankheiten," 1887, S. 797.

toes of the syphilitic variety. Wigglesworth * describes several cases in which the toes were affected, one in an adult and the other in a child three years old with hereditary syphilis. The first phalanx is generally affected first, but any of the others may be, and the affection may extend from one to two or more phalanges. Most authorities agree that the affection is a rare one excepting Gross,† who claimed that it was not at all uncommon and that he had seen a great many cases. I have made inquiries at several of the dispensaries where large numbers of children are treated annually, and the attending physicians assure me that the disease is exceedingly rare with them, most of them having seen only a very few cases in a number of years, and others none at all.

In syphilitic dactylitis we have a deposit of the peculiar gummy material of tertiary syphilis, occurring in one or in all of the deeper structures, and producing a peculiar deformity, the swelling of the bone being found more over the dorsal than over the palmar or plantar surface. We recognize two distinct forms of syphilitic dactylitis. One an inflammation between the periosteum and the bone, constituting a specific periostitis; the other, an involvement of the cancellous tissue around the medulla, forming an osteomyelitis. The tissues overlying the bone may or may not be involved, and the disease may extend to the joint and affect the synovial membrane. The skin has a livid hue and is tense, this disappearing as the swelling diminishes. The condition of the tissues seems to be one of colloid degeneration, and when these tissues break down, as sometimes happens, sinuses are formed from which exudes a yellowish-brown material, which, under the microscope, is shown to consist of granular, amorphous matter, sometimes bone-cells but never pus-cells, for the disease does not undergo suppurative changes.

Patients complain of little, if any, pain, which, when it does exist, is of a gnawing character. Sensation is not disturbed, and where the joint does not become involved motion is normal and causes no pain. The nails are never included in the pro-

* Wigglesworth, *American Journal of Syphilis and Dermatology*, January, 1872.

† Gross, "System of Surgery," 1882, vol. ii. p. 1012.

cess. Sometimes a distinct crepitation can be made out, this being of an albuminous character. The patients usually come under treatment for other ailments, this condition being so trivial, except for the deformity, as to have gone unnoticed.

It is important to differentiate the two varieties of dactylitis from each other. This can only be done by obtaining a careful history, both as to the health of the parents and concerning the child's condition since birth. If the disease comes on in the first few months it is of the syphilitic variety. Should any doubt exist, it is well to give the patient the benefit of the doubt, and place the child on the antisyphilitic treatment, and thus the treatment would also aid in clearing up the doubt as to the origin of the disease. The disease must be differentiated from gout, but in gout we have an acute invasion, pain, and the previous history. The disease could also be mistaken for rheumatoid arthritis, but in the latter affection the joints are involved, there is no swelling of the phalanx, but a peculiar angular deformity of the finger and the integument remains normal. Besides, gout and rheumatoid arthritis are exceedingly rare in young children, even much rarer than dactylitis. Furthermore, the disease must be differentiated from enchondroma and exostosis, but in these affections the swelling occurs more on the palmar or plantar surface than on the dorsal, and they grow slowly, and present a hard, well-defined tumor.

The prognosis in both forms is good, especially if the case comes under treatment early.

The treatment, of course, depends upon the causation. If the dactylitis be of the strumous variety, we should attend especially to the diet and the hygienic surroundings. Give the child cod-liver oil and the hypophosphites, syrup of the iodide of iron, cold baths, etc. When the disease is due to syphilis, use the iodide of potassium and mercury internally in combination. Use inunctions of unguentum hydrargyri or the oleate. A useful plan is to massage the affected phalanx, employing the ointment or the oleate of mercury. Under these plans of treatment the swelling will diminish, the sinuses close, and the disease disappear in the course of several weeks or months. Operative interference is never necessary and should be condemned.

A CASE OF SARCOMA OF THE KIDNEY.*

BY FREDERIC M. WARNER, M.D.,
Visiting Physician to Charity Hospital, Physician to Bellevue Hospital, Out-door Deptartment (Diseases of Children), New York.

PRIMARY malignant disease of the kidney, when occurring in childhood, makes its appearance, as a rule, under the age of three years, and is characterized by the rapid growth of a tumor, the appearance of which is, in the majority of cases, the first manifestation of the affection.

The mass is primarily observed situated between the free margin of the ribs and the crest of the ilium, gradually making its way forward towards the umbilicus, upward to the hypochondriac, and downward towards the inguinal region; in extreme cases it may finally nearly fill the abdominal cavity.

When the right kidney is affected, the liver is displaced to the left and may be twisted upon its transverse axis; especially is this so when the growth extends from the upper portion of the kidney into the right hypochondriac region.

When the tumor is of the left kidney, the stomach is diverted forward and to the right, and the spleen is displaced upward. By examination the mass appears smooth and rounded, or may be lobulated, and there is generally a distinct sense of fluctuation to be obtained over portions of it.

The *colon* may always be found lying in front of the tumor. This rule is invariable, and the difference in the percussion note over the gut reveals its situation.

The only other symptom of importance besides the presence of a foreign growth, is one which is constant in about fifty per cent. of the cases, and that is *hæmaturia.*

The hemorrhage may be either acute and profuse in quantity, so much so as to cause death; or, acute and in small amount, giving rise to no symptoms or disturbance; or, very small in quantity and pretty constant; or, infrequently, and very little at a time, so as only to be detected by means of the microscope.

* Read by title.

In some cases hæmaturia has been the first symptom of the disease; in any case it is of great importance in making a diagnosis, and in those instances in which it is absent it is probably due to the ureter being occluded by the growth, or by the pressure of the tumor.

The other symptoms of cancer of the kidney are variable; of these, *pain* may or may not be present. Generally the patient, when old enough to discriminate, does not complain of the tumor, except of the inconvenience consequent on its weight and size; *gastro-intestinal* troubles are pretty constant; *œdema* of the lower extremities and face occurs; *emaciation* rapidly takes place, and the *skin* presents a well-marked cachexia, and death results from exhaustion.

The duration of the disease varies considerably. The majority of the patients, however, succumb between eight months and a year from the onset.

In size the tumor averages about seven pounds. Roberts * mentions one weighing thirty-one pounds, the age of the patient not given. Spencer Wells † records a case in which the tumor weighed between sixteen and seventeen pounds in a child of four years.

The following is the history of a case occurring in my own practice, which presents quite the typical course of the disease:

On October 19, 1885, a child was brought to me by the mother, presenting for examination a tumor, which had been first discovered by the parents the preceding evening. The child, a fat, healthy-looking infant, six months old, had never been sick until a week before, when it suffered from an attack of vomiting and diarrhœa, which yielded to domestic remedies.

Upon examination, I found a large swelling occupying the entire left lumbar region and extending up under the ribs; it could be mapped out in the back nearly to the spinal column, and in front it presented a convex border, the greatest horizontal diameter of the mass being opposite the umbilicus; below it dipped down into the pelvis. It seemed to be round or oval in shape and was quite hard to the touch.

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* Urinary and Renal Diseases.

† Abdominal Tumors.

SARCOMA OF THE KIDNEY.

The mother said that some time previously, she thought when the child was six weeks or two months old,—she could not tell the exact time,—the baby was lying on a pillow on the floor before a long window opening out on a piazza; that a little sister five or six years old, running in, had stepped on the child's side with her full weight, but there had never been noticed any bad effects until now.

From the time when I first saw it the tumor grew rapidly, but it was not until November 4 that any impairment of the child's health was noticed, when it commenced to vomit a greenish fluid. I was not called until the 6th, when I found the child apparently in a state of collapse. It still vomited, had had two small evacuations from the bowels, but had passed no urine in twenty-four hours, and had greatly emaciated. It had refused to nurse, and I noticed regular automatic movements of the right hand and arm, up to the head and down again; the eyes were staring and the child cried frequently as if in pain.

Under appropriate stimulation and other treatment the child rallied, and in a couple of days was apparently as well as ever, except that it now commenced to pass urine in small amounts and very frequently, as the tumor was growing very rapidly, and encroaching considerably on the territory of the bladder.

I lost sight of the child again until February 15 of the following year. I found that during this time the mass had grown greatly, occupying apparently nearly the entire abdominal cavity; it was distinctly elastic and nodular, which last condition is well shown in the accompanying photographs taken at this time.

The patient had greatly emaciated; the skin was of a dirty-white color, and the abdominal distention was coursed by large superficial veins; the eyelids were puffy, and there was considerable conjunctivitis; the feet, and legs up to the knees, were much swollen; the bowels were quite regular, and the child was passing a good amount of water and at not very frequent intervals; all of this time the appetite was voracious, desiring to nurse constantly, the mother being possessed of a good supply of milk.

There was ever-increasing restlessness, but no return of the

automatic movements previously observed, and no apparent pain; the patient seeming merely to suffer inconvenience from the mechanical presence of the mass.

Pertussis now appeared as a complication, and from this time until her death, from exhaustion, on June 26, eight months after the first appearance of the tumor, I saw her daily; she gradually emaciated and the mass grew larger.

At the autopsy, eight hours after death, I removed a large tumor, occupying nearly the entire abdominal cavity; the body had but a small pedicle, and shelled out easily, being attached by only a few slight adhesions.

The gross appearance was of an enormously enlarged kidney. On microscopic examintion it proved to be a spindle-celled sarcoma. The right kidney was found to be quite healthy. This explains why the urine continued to be normal, as the diseased kidney was shut off from the bladder by the occlusion of its urethra from compression.

In reference to the etiology of this affection, I am of the opinion that congenitally a pathological growth exists, which in some instances commences to increase from no known cause, unless, as is clearly demonstrated in the case I have just related, the excitation be produced by a traumatism.

It is possible that the growth may remain latent during childhood and middle life, and not begin to increase before old age, which, as we know, shares with extreme youth the dangers of this disease; further, it is possible that cases have occurred, and will occur, in which this pathological growth will remain latent during lifetime, never increasing nor giving rise to any symptoms.

The *treatment* of malignant disease of the kidney, is removal of the mass, and this should be done early; there is no likelihood that there will be many or strong adhesions; secondary deposits in other organs are not liable to be present, and as a rule the other kidney is not affected.

If we do not have recourse to operative measures a fatal termination is inevitable. If my patient had been operated on when I first saw it, when apparently in good general condition, although the tumor might possibly have weighed a couple of pounds, its life might, in my opinion, have been saved.

Grancher, in the *Journal de Méd. et de Chir. Pratiques* for September, 1889, while discussing the occurrence of renal tumors in several children which were observed in the Hôpital des Enfants Malades in Paris, in referring to the treatment of such cases, urges, where the condition is early recognized, and without evidences of serious functional disturbances, that extirpation be resorted to.

ON WHAT EARLY SYMPTOMS MAY WE REST A DIAGNOSIS OF TUBERCULAR MENINGITIS?

BY W. P. NORTHRUP, M.D.,
New York.

TUBERCULAR MENINGITIS, no one will deny, is difficult of diagnosis. There is no other lesion in infant life which creeps in so unsuspectedly, which develops so quietly, and whose fateful growth may place the physician in such awkward attitude. It fails to appear when foretold; more often arrives unlooked for.

This paper proposes a question,—What three or four symptoms do you, severally and individually, regard as the most reliable signs of tubercular meningitis in infancy? For the sake of giving point to the discussion, I limit it to any four symptoms and to the first two years of life. My own answer to this question I give at the outset and illustrate with cases, the object in pursuing this rather unusual order being to make more clear the points I propose to bring out. On these four legs, then, will I rest my diagnosis:

1. Persistent vomiting.
2. Irregularity of pulse.
3. Irregularity of respiration.
4. Apathy.

I was recently invited to see in consultation a bottle-fed infant ten months old. The child had been under the care of several excellent practitioners in different parts of the country, as it travelled about, and the sources of information regarding

its history were necessarily scattered. Eventually a full and satisfactory record was obtained; but I am going to relate the case to you, giving the information as it came to me, and finally the completed history gathered from different sources. An infant, when five to six months old, was taken abroad for the summer, spending two months in Paris. The child was fed from the bottle, and remained with a faithful nurse in town while the parents made occasional excursions elsewhere. Up to one month before the beginning of the illness which interests us the child had never been sick. A physician, a friend of the family, accompanying the party from Paris to Liverpool on their way home, remarked how well the child looked, how happy, even merry, it was, how healthy its flesh seemed, while its color and general development bespoke a most promising child. After a few days' sojourn in Liverpool in perfect health it entered upon an eight-day voyage for this port. On board ship it was fed on canned condensed milk. On the morning of the eighth day the mother concluded that the contents of the open can were not just right, and a second was opened. On sniffing it she detected a decided odor of decomposition, and the two cans were thrown overboard. A third can was opened, and from this the child was fed. Scarcely had the portion been taken when the entire contents of the stomach were vomited. Nothing more was given it on shipboard, as in the afternoon the passengers were to be landed, and fresh milk could be obtained. This was the first vomiting. In the evening the child was fed on fresh cow's milk in this city, and again vomited. A physician was called, found a temperature of 101° (rectal), prescribed for the case, and sent the family to the country to the care of a third physician. Though fed on the choicest of milk, it continued vomiting after feeding. A week later the family returned to town and to the care of several more members of the medical profession. The child continued to vomit after feeding, maintained a temperature of 100° to 101°, was moderately constipated, and was said to have been drowsy and rather stupid during the last of its stay in the country. The city physician very wisely administered a mild cathartic to the patient, which resulted in a copious passage of greenish, offensive mucous masses with

coagulated milk. The case was seen at this time by an eminent consultant, who declared it was impossible to pronounce on the case on one observation, and reserved judgment. On the second day thereafter he saw the child again and diagnosticated tubercular meningitis without reserve, gave an absolutely unfavorable prognosis, saying the child could not live twenty-four hours. On the morning of this day the temperature had suddenly mounted to 105° F. Later in the day it sunk to 103°.

It was in the evening of this day that I was privileged to see this interesting case, and please remember I am repeating at this point only the history that was obtained at that time, meagre and unreliable. The known facts were as follows: A child of healthy young parents, in the tenth month of its life, after uninterrupted good health and satisfactory growth and development, suddenly vomited after taking food preserved in tin cans, and which was in a doubtful state of preservation. For a week or more it continued to vomit after feeding, though supplied with fresh cow's milk in the country. Later it became languid, occasionally drowsy or even stupid. Its bowels were at times loose, later inclined to constipation. Catharthics effected a movement copious, dark, offensive, containing greenish mucous masses, and once a small amount of blood. After such passages the child became brighter for a time. One or two days previous to my visit, it developed ptosis of left, dilatation left, internal strabismus left. One day previously a temperature of 105° to 103°; pulse said to have been small, thready, regular; respiration rhythmic. There had never been any convulsions, so far as learned, nor screaming, nor irritability.

The child was lying in its crib, apparently sleeping, its color a little pale, with slight blueness about the lids. There was nothing about its appearance to attract attention, except a dull, relaxed, mask-like expression, or rather utter lack of expression,—a *dead look.* Its eyes were fully closed; there was no inequality in the two sides of the face. The anterior fontanelle, about an inch and a half across its angles, was level, normal. There was nothing about the condition of the skin or superficial veins to be noted over the scalp or

any part of the body. Abdomen normal; head inclined to turn to the right. No rigidity, no stiffness of back of neck; no automatic movements. In short, the infant was sleeping, so far as outward appearances went, excepting the expressionless, mask-like countenance. As to respiration, it was quiet, about thirty to the minute; after careful watching and listening, it seemed to me irregular in depth, but not markedly so. No irregularity had been observed by those in attendance, and after still further listening and watching, I concluded that this point was at least doubtful. The pulse was counted for several consecutive half-minutes, and was found to be beating about 140 per minute, without intermission and without sensible variation in force or frequency. On examination of the eyes, the result corresponded to the observations recorded above,—viz., pupils unequal, dilatation left, reacting tardily, internal strabism left.

Here is related an experience familiar to you all, and is of value for the purposes of this paper. The question before the physicians in consultation was, whether there was any possible escape from the diagnosis as pronounced above. Their own observations were of short duration and the previous history was from unreliable sources. Might these cerebral symptoms be associated with gastro-enteritis so obviously present? could they arise from anything but meningeal lesions?

Let me set forth once more the main points. A well-nourished child, ten months old, with good parentage, had been sick seventeen days. Symptoms: vomiting after feeding; offensive mucous passages, once containing blood; drowsiness, varying in degree and temporarily relieved by catharsis; for two days ptosis, strabismus, inequality of pupils; temperature 105° to 103°; stupor. No history of convulsions nor irregularities in pulse or respiration. It will be noted that the elevated temperature was coincident with the accession of several new symptoms.

Just at this point in the consideration of the case in hand, let me call your attention to the following cases in which the histories are complete:

CASE I.—Cerebral symptoms with entero-colitis. Autopsy,

—child two years old. This child was returned to the New York Foundling Asylum by its nurse, because, besides diarrhœa, it had "spasms of the face." On entrance it had left facial paralysis well marked, paralysis right hand and foot slight, ptosis left, pupils equal, alternately contracting and dilating, difficulty in swallowing, movements of limbs limited, stiffness of neck, lying flat on its back, conscious, making no sound. Temperature, 104¼°. During the next twenty-four hours it had repeated general convulsions, and died with œdema of the lungs.

Autopsy.—Brain normal, mesenteric lymph-nodes enlarged, simple hyperplasia, small intestine contained an extraordinary amount of thick mucous masses, solitary follicles enlarged and many of them ruptured. Peyer's placques markedly swollen; one in mid-ilium excessively so. Large intestine in much the same condition, the contents being darker. Briefly: A well-nourished child, two years old, diarrhœa two weeks, "spasm of face," paralysis, left facial, right ptosis, right hand and foot, oscillating pupils, dysphagia, stiffness back of neck, general convulsions.

CASE II.—Cerebro-spinal symptoms with entero-colitis. Child six months old; female; always in "poor" condition; dullness left apex; 103°. Three days later, *opisthotonos* marked, restlessness, alternating diarrhœa and constipation, vomiting, glandular enlargements, sunken abdomen. Opisthotonos increased for twelve days and became continuous; when the occiput and heels were placed on the table the vertical distance from the plane of the table to the highest part of the arch formed by its body was four or five inches. On autopsy the peritoneum had a "washed-out" appearance; the intestines contained greenish mucous masses, the walls of the gut being very thin, pale, and transparent. Brain and cord were normal; kidneys, normal; middle ears, normal; bones, normal. Here was vomiting, opisthotonos, alternating diarrhœa and constipation, sunken abdomen; lesion entero-colitis.

CASE III.—Cerebral symptoms; entero-colitis. Male, three months old. Marasmus, convulsive movements of eyes, strabismus. It would apparently be looking fixedly at the

tip of its nose for a fraction of a minute, the eyes quivering; the spasm then would relax for a minute and begin again, so continuing, the intervals being longer at times.

Autopsy.—Catarrhal enteritis, swelling of follicles, single and agminate, with enlargement of lymph-nodes of mesentery. Brain "wet," œdema of pia-mater.

CASE IV.—Gastro-entero-colitis; cerebral symptoms. Female, six months old; was under observation two days; tense bulging fontanelle marked; rolling head; blindness, nothing attracting its attention; eyes widely open and staring; pupils equal and reacting; died without convulsions. Body emaciated; fontanelle two inches across angles; sutures ununited; rickets.

Brain.—Normal.

Stomach.—Contents viscid mucus, abundant; mucous membrane red in patches, sodden; intestines, increase mucus, tenacious, jelly-like, stained with bismuth, also greenish masses of mucus; solitary and agminate lymph-nodules swollen and ulcerated at apices. Colon in much same condition; mesenteric lymph-nodes uniformly enlarged, pale, red; peritoneum having a washed-out appearance. Here was a tense bulging fontanelle and blindness, in a lesion of the alimentary canal.

CASE V.—Cerebral symptoms; central pneumonia; recovery. Female, three years old.

In the service of Dr. O'Dwyer I recently saw at the New York Foundling Asylum an interesting case, and all the more interesting because I was at that time studying the cases reported in this paper.

A dark-skinned girl was lying in her crib, scowling and staring straight before her. The eruption of measles had just disappeared. For a time the temperature had run along 104½° to 103°, and at last, on the fourth day, dropped to 100½° rectal.

On the fifth day it mounted again to 103°, then to 104°, and with this increase came the stupor which now attracted attention to her anew. Eight days after the first eruption of measles, and three days after the second rise of temperature, the symptoms were as follows: Squint (which proved to be congenital); dyspnœa; result of chest examination negative;

stupor going on to coma; constrained posture; eyes sometimes open, sometimes closed, always scowling; hands clinched, and elbows raised. She seemed never relaxed, but rather under tension, as though prepared to respond to every jar or sharp noise with a quick jerk or short spasm. When spoken to, she gathered up her face as if to cry, and emitted a faint peculiar whimper. At times she was blind; at others a watch and dangling chain would attract her attention. *Tâche cérébrale* was absent; pulse 132 to 160 per minute, regular, after repeated counts; respiration 40, rhythmic. No stiffness of neck. A night cry was described by the nurse which was fairly characteristic of meningitis. While we were in the ward the child had two or more mild convulsive seizures with marked opisthotonos. At this time Dr. O'Dwyer made out dulness over the root of the left lung without bronchial breathing; at this particular moment standing alone in his diagnosis of pneumonia with cerebral symptoms.

Here was a scrofulous, dark-skinned child, scowling, apathetic, blind, having repeated convulsions with opisthotonos, crying out at night; slight inequality of pupils. Granting it had the faint dulness over one root, there might easily be tuberculosis beginning its work there as well. I confess I believed this was tuberculous meningitis. "All signs fail in dry weather," and, in case of doubt, a dark-skinned child (part negro), is sure to prove to be tuberculous.

Here, then, while collecting cases for preparing this paper, I ingloriously laid aside the very legs upon which I am going to advise you to rest the burden of diagnosis. To this I will refer later. I have admitted you into the confidence of the visit in which my diagnosis had its best outlook and most adherents. I was not at all sure there was even the slightest dulness, and all doubting parties present came over to my side. A few days later,—two or three,—all other symptoms remaining the same, the dulness became distinct over the left lung, and was acknowledged by all. The case gradually cleared up, all physical signs of deep-seated pneumonia disappearing; and step by step with it departed all cerebral symptoms. I have this very day seen the child trotting about, with still a slight amount of strabismus, without the frown and without remnant or sug-

gestion of a previous lung lesion, except a few râles, possibly intrapleural.

Let us see now on what Dr. O'Dwyer based his faith in his diagnosis as against tubercular disease.

1. There was a history of measles five to eight days before, at the same time he believed he made out slight dulness in the left axilla, high up.

2. Temperature was too high for tubercular meningitis, 103° to 104°. It may here be added, the temperature had continued rather high through the five days of measles,—104°, 104½°, 103°, 101¼°, 100½°; then up to 103°, with beginning of stupor.

3. No stiffness of back of neck.

4. No persistent vomiting,—vomited twice.

5. Pulse was rapid, regular, without marked variation from time to time.

6. Respirations, forty per minute, rhythmic, no sighing, no variation in depth, no approach to the characteristics of the Cheyne-Stokes respiration.

I may here add, it had not the dull, expressionless countenance referred to early in the paper, but rather an expression of irritability, often described as belonging to the first stage of (simple) meningitis. It will be observed that none of these cases showed inequality of pupils.

Now, to return to the consideration of our first case, ten months old, sick seventeen days. Was there any escape from the diagnosis of tubercular meningitis? There was a good history of gastro-entero-colitis, drowsiness varying in degree, ptosis for two days, strabismus, inequality of pupils, temperature 105° to 103°, increasing stupor, without history of convulsions, and, so far as known, without irregularity of pulse or respiration. Among the entero-colitis cases with autopsy we found drowsiness, oscillating pupils, "spasms of face," dysphagia, stiffness of neck, opisthotonos, vomiting and constipation, bulging fontanelle, blindness, ptosis, strabismus, local paralysis, and convulsions. There was then possible escape from the diagnosis, taking into consideration the history before us, the observations then made, and bearing in mind the cases just presented before you.

I will now invite you to the confidences and revelations of a second consultation two days later. In the interval the child had been given the benefit of doubt. The ice-cup was continued on the head, a full calomel purge was effected, hot baths and frequent internal stimulation added. The child looked brighter, opened its eyes, watched the nurse about the room, its ptosis diminished, and strabismus was believed to have temporarily disappeared.

Two days later,—third consultation,—inability to swallow, bulging tense fontanelle, Cheyne-Stokes respiration, scaphoid abdomen, imperceptible pulse. Twelve hours later, death.

After carefully going over the history with the mother, with the nurse, with the various physicians in attendance, and communicating with the physician in the country; after putting together all the facts coming out in whatever way, I have collected them together here, and now lay them before you, let me rehearse again this most instructive and most typical case of tubercular meningitis. A child nine and a half months old, of healthy young parents, itself in apparently excellent general nutrition, suddenly began to vomit all food. It cried in the night rather immoderately (so the nurse remembered), bowels irregular, sometimes constipated, sometimes loose. In the first week of vomiting (the mother voluntarily added this) it "cried out" in its sleep as though having "bad dreams." It was sensitive to light, scowling and showing irritation; was not sensitive to sounds; indeed, slept rather better in car or carriage. Sighing was occasional, and was noticed by the attendants; automatic movements, sweeping its hand over its face as though brushing away a fly, repeating these movements over and over, also putting its hand to its ear. No hyperæsthesia, no stiffness of neck. The child was considered more than ordinarily irritable, even before its first vomiting, and was thought to have a staring expression. During the second week drowsiness began and increased, but the child could be easily aroused; vomiting continued. The pulse at times was irregular; in a quarter-minute it would be 30, followed by a quarter in which it was 50, and again 30, all this time the child being in stupor or asleep. Then developed ptosis, strabismus, unequal pupils, dysphagia.

In the third week the drowsiness became coma, the countenance expressionless, mask-like. The child emaciated rapidly; the abdomen, which had been normal, became sunken, "boat-shaped;" Cheyne-Stokes respiration well marked; pulse rapid and feeble and intermittent; fontanelle elevated and tense; swallowing impossible. There was no convulsion, no nystagmus, no lung complications. In a prolonged conversation with the mother, the information came out that the physician in the country sat for an hour at a time on several occasions watching the pulse and respiration and general behavior of the infant as it lay in its early stupor. It gives me satisfaction to say that this young physician, a recent graduate of Roosevelt Hospital, made an unreserved diagnosis of tubercular meningitis, and, if our history is correct, he based it on the early symptoms set down at the head of this paper. I would regard as characteristic and reliable for early diagnosis the symptoms shown by this infant in its first week; that is, while in the country. Its prodromal symptoms were irritability, vomiting. Its accompanying symptoms were eye disturbances, inequality of pupils, ptosis, automatic movements of hands, hydrocephalic cry.

Its diagnostic symptoms were persistence of vomiting, variation of respiration, variation and intermission of pulse-beats, followed by apathy, with its characteristic expressionless countenance.

DISCUSSION.

DR. EARLE.—In the first place, I would like to ask Dr. Northrup if a post-mortem examination was made in this case?

DR. NORTHRUP.—I regret to say it was impossible to get an autopsy.

DR. EARLE.—Then I would ask him how he knows it was a case of tubercular meningitis?

DR. NORTHRUP.—There was no autopsy. I do *not know* that it was a case of tubercular meningitis. But I would ask Dr. Earle whether he is not sure in his own mind, judging by the symptoms given, that it was a case of tubercular meningitis?

DR. EARLE.—I am not. Tubercular meningitis is one of the most difficult diseases to diagnosticate that occurs in my practice. Several years ago, before I had studied the diseases

of children as much as I have since, I wrote a paper in which I said this: "If I were asked the question by a young practitioner, what were the three most difficult diseases among those peculiar to children to diagnosticate and treat, I would say, tubercular meningitis, entero-colitis, and laryngeal stenosis." If asked now to answer that question, I might modify my answer somewhat, but I should certainly include as difficult of diagnosis tubercular meningitis.

I desire to express my appreciation of the paper presented by the doctor, and to say that in my judgment the studies he has made will certainly be of aid to us in the diagnosis of this obscure disease, but I shall have to take issue with him on some points. I will name four symptoms on which I would base my opinion in attempting to make a diagnosis of tubercular meningitis, all of which occur earlier in the disease than three of the symptoms mentioned by Dr. Northrup. Of the four symptoms named by the author, he does not claim to observe three of them until the child is well along in the second stage of the disease; that is, irregular pulse, irregular breathing, and apathy. I agree with him that they do occur in the disease under consideration, but not until late. The only symptom which he has given us of any value during the early stage—during the first week possibly—is that of vomiting, and he did not take time to point out the difference between ordinary and cerebral vomiting. If this symptom is worth anything in the diagnosis of tubercular meningitis, or any other form of meningitis, I believe it must be the cerebral form. Every member of this society is familiar with the difference between the ordinary physiological vomiting which is noticed in nearly every well-nourished child, and the *projectile* vomiting, which is almost pathognomonic of some cerebral trouble. This form of vomiting, however, does not enable us to distinguish between simple meningitis and tubercular meningitis. To do that we have to go back and inquire into the history. If I were asked, then, for four early symptoms in tubercular meningitis, I should name, in the first place,—

1. A protracted initial stage of slight fever and uneasiness; a desire to go from one person to another; a tendency of irregularity of conduct which sometimes lasts ten days. The child does not know what it wants. One moment it is in the nurse's arms, the next in the mother's, then in the father's, and so on; a long prodromal period which indicates that something is coming.

2. A history of some hereditary taint or trauma. Combine such a history with the first symptom, and you have something of value.

3. If, in addition to these, you recognize cerebral vomiting, you will have three symptoms which will give you a very fair idea of what is going to happen.

4. Local spasm. To illustrate this point, several years ago I saw a case which had been treated by several physicians for intermittent fever and typhoid. Coming in just at the right time, with two or three weeks' previous history at my command, I was able to correct their error, depending largely upon the local spasm,—the neck being drawn to one side and backward. It is not necessary that all the muscles of a part be affected to show that there is some brain lesion. These four symptoms, then, I regard as of greater value than those named by Dr. Northrup.

Dr. Rotch.—I am still not much enlightened as to the initial symptoms of tubercular meningitis. I do not know how to make the differential diagnosis of this disease during the first year of life, and the paper limits the discussion to early life. During the first year the symptoms are very indefinite. We do not then have, as a rule, typical cases. They differ from the tubercular meningitis of older children, or those of the third, fourth, or fifth year. The case which Dr. Northrup mistook for tubercular meningitis I find no difficulty in recognizing, as Dr. O'Dwyer did, as one of pneumonia. They are not very uncommon. As long as a man may be mistaken in such a case he should hold his diagnosis in abeyance. That is the great secret in making a diagnosis in children,—hold it in abeyance. We know well enough that tubercular meningitis and the cerebral form of pneumonia resemble each other very closely, and some time may be required to make the diagnosis.

As just stated, tubercular meningitis is not typical during the first year of life, and I believe that when you attempt to lay down four symptoms you go far wide of the mark. I think Dr. Earle is perfectly right,—that might have been a case of tubercular meningitis, and it might not. We have no proof. But the four legs on which the diagnosis stands I do believe to be sound legs. Take, for instance, respiration. It was irregular. But we know well enough that during the first months of life the whole nervous system is growing so rapidly that it can be excited to all sorts of curious manifestations. Any man who makes a diagnosis from irregularity of the pupils in the first year of life makes a very rash diagnosis. You can have cerebral symptoms and no cerebral disease, and why is it? Because in a very large number of cases reflex symptoms come on, due to the fact that the nervous system is growing very rapidly. An irregular pulse and respiration,

and other symptoms which would denote cerebral disease in an older child or adult, may arise during the first year of life from an irritable tooth or middle-ear trouble, for the circulation of the middle ear is very closely connected with that of the brain. I have but recently seen a case in which the diagnosis was made of meningitis, the child having convulsions, irregular pupils, irregular pulse, irregular respiration, and the surgeon raised the question of an operation, yet the child had no trouble except disease of the middle ear starting from the root of a tooth.

I acknowledge that an intermittent pulse is a symptom of meningitis in older children, a very strong one. Henoch laid that rule down long ago. But we must accept it with care. I have seen it over and over again, with the symptoms which Dr. Northrup has described, and yet the children got well. It is very doubtful whether we ever cure a case of tubercular meningitis. The patient generally dies within a year or two years.

With regard to cerebral vomiting, I am beginning to be a little sceptical even about that. We are now opening up a new field of medicine in which the reflex nervous symptoms are going to play a great *rôle*. We are going to find that the baby in the first year can give symptoms of disease in almost any organ of the body, and yet they may be purely reflex. There are cases, though somewhat rare, of purely reflex vomiting, the children vomiting without any nausea whatever. It usually begins in the first year of life; is explosive, simulating so strongly the vomiting of tubercular meningitis that I am not able to distinguish between them. Then I have seen cases in which all the symptoms mentioned by Dr. Northrup were present, yet the condition was one of cerebral thrombosis. So that one cannot diagnosticate tubercular meningitis with the four symptoms mentioned in the paper as a basis,—vomiting, irregular pulse and respiration, and apathy. I also protest against apathy being considered diagnostic of cerebral meningitis. I have seen babies lying side by side in bed, hour after hour and day after day, and have been unable to distinguish between the apathy of cerebral disease and simple atrophy. It may occur in the pneumonia of the young child, either of the apex or base.

We, then, should hold our diagnosis in abeyance, and in closing I may say that convulsions can be caused in some young children simply by touching the membranum tympani with cotton on a probe, and the same thing may occur in middle-ear disease from the close connection which exists between the ear and brain in young babies through the open squamo-petrosal suture.

Dr. Jacobi.—The two gentlemen who have already spoken have promised further contributions to this discussion. I should have enjoyed it more if they had said everything they had to say at once, so that I should be perfectly sure I had nothing to add.

I must congratulate Dr. Northrup on the fact that he has written a paper which has elicited so lively a discussion, full of knowledge and sentiment. Still, something may yet be said.

I am also of the opinion which has been expressed by Dr. Rotch, that Dr. Northrup has given symptoms of tubercular meningitis as it appears in children from two to seven years of age. At that age the four symptoms he has spoken of are much more common than in the tubercular meningitis of the very young. I should very probably, with him, if I found those symptoms, with a history of premonitory symptoms extending over a week or two, make a diagnosis of tubercular meningitis, and I believe that in the large majority of cases it would be shown at the post-mortem examination that I was right. But we can not be so perfectly sure. Let me make some remarks on those symptoms.

First, there may be a very slow and irregular pulse, extending over months, and I have seen it extending over years, in children suffering from profound anæmia,—children walking about, even playing about, but having other symptoms of profound anæmia. I have seen that many times, and in former years I felt almost sure the cause was cerebral irritation.

As to vomiting, it is, as Dr. Earle has said, seen in the second stage of tubercular meningitis. There may be reflex vomiting too, but the cerebral vomiting in these cases has this peculiarity, that, like the vomiting of pregnancy, it is elicited at once when the child is raised from the pillow. It is projectile, and is not preceded by nausea. But there are large numbers of cases of tubercular meningitis in which there is very little vomiting, and there are some in which there is no vomiting at all. These cases occur, too, in those of early age. Then there are cases of tubercular meningitis, principally of the superior surface and not of the base. It is only in tubercular meningitis of the base that we have vomiting. By the very absence of vomiting I have sometimes been able to diagnosticate tubercular meningitis of the surface.

There is one symptom which has not been spoken of during the discussion, as far as I remember,—namely, peculiarity of the temperature. This is notable in most cases of just such pronounced type as Dr. Northrup has postulated. Vomiting

sets in, perhaps, towards the end of the second week; there is very severe suffering, very serious illness, yet no elevation of the temperature. Those are the cases in which the four symptoms mentioned by Dr. Northrup are likely to develop; that is, cases between the ages of two and seven years. The first stage, that of irritation, is usually not observed by any medical man. It is very seldom that the doctor is called in during the stage of morosity, peevishness, and sleeplessness. Usually, when called, a series of symptoms are reported and observed, and he suspects tubercular meningitis. In such cases one hardly knows whether there was or was not elevation of the temperature in the beginning, but when called he finds either no rise, or only half a degree or a degree (F.) of increase.

While at the older age a large number of cases of tubercular meningitis run the slow and peculiar course just spoken of, yet in a number of cases of the very young that description does not apply at all. The disease does not run a slow course; it does not begin with little or no increase of temperature, but it is high, and it is in this class of cases that the diagnosis is so difficult. Vomiting does not amount to much, but brain symptoms do, particularly delirium. Unilateral symptoms here may mean a great deal in diagnosis, especially in differentiating tubercular meningitis from nephritis. The latter disease is very common at an early age, so common that two or three weeks ago I had no difficulty in making a diagnosis of nephritis, where meningitis had been diagnosticated in a baby of seven weeks. Usually in nephritis the cerebral symptoms are bilateral, while in tubercular meningitis, for good reasons, they are usually unilateral. But even here we may be mistaken, for there are some cases of nephritis in which the cerebral symptoms are unilateral.

I may say, further, that it is often difficult to distinguish tubercular meningitis, first, from simple meningitis; second, from rheumatic meningitis, which I have seen; third, from syphilitic meningitis. And it is now and then very difficult to diagnosticate from otitis. Then there are a number of cases in which there is considerable retraction of the head, moaning, opisthotonos, or acute torticollis, depending either on deep-seated inflammation or simple rheumatic affection of the mucles. In some such cases, particularly in which there was intense pain and some vomiting, perhaps convulsions, it has been impossible at once to make the diagnosis until the disease has run its course,—about ten days. Such cases have been reported by Legroux. From all this it is evident the differential diagnosis is very difficult. Besides, we must not forget

that meningitis may complicate other diseases. First, there is typhoid fever. Probably all of us have now and then seen cases in which meningitis complicated this disease in the adult and very young child, not to speak of the cases in which the nervous symptoms were such as to make it difficult to say whether there was or was not typhoid fever back of them.

The diagnosis, then, is not really so simple. If I had the four symptoms Dr. Northrup has named, with premonitory symptoms extending over a week or two, I very probably should make the diagnosis which he made, but, as I have already said, that is a series of symptoms seen principally in older children, not in the very young. The cases of surface meningitis are the ones in which apathy and somnolence show themselves earliest. That is quite natural, for the cortex is affected.

Dr. Winters.—I think the four symptoms enumerated by Dr. Northrup, when properly used, and applied to the child at the proper age, are very valuable and almost positively diagnostic. We are perfectly aware, as Dr. Rotch has said, that all these symptoms may occur during infancy from reflex troubles. Any physician who sees much of tubercular meningitis does not think of making a diagnosis of this affection at his first visit because the symptoms mentioned are present; he has come to be cautious in his diagnosis. He first thinks of reflex causes, and if he finds any reason to suspect their existence, seeks to remove them. If he can exclude these, he next inquires into the history. One would hesitate a long time before making a diagnosis of tubercular meningitis without a history. If he cannot find a tubercular family history, near or remote, he should inquire whether the child has not had some disease which entitles it to auto-infection. With no other apparent reflex or other cause, the symptoms mentioned, taken with a proper history, are almost absolutely diagnostic of tubercular meningitis. Having advanced thus far, the cautious physician will do as Dr. Northrup's friend did, sit by the bedside of his patient by the hour, for these symptoms are not very valuable unless watched hour after hour. It was this patient watching which first taught me the importance of these early diagnostic symptoms of tubercular meningitis. It has been my habit for years, when a child is brought to the dispensary with symptoms pointing to cerebral irritation, to go to the house and study it by the hour when asleep. Following this course, these symptoms have not misled me. Of the symptoms named, it seems to me irregularity of the pulse is most important of all. Watch for it by the hour, and you will surely

find it. When the other symptoms intermit, this peculiarity of the pulse still persists, and constitutes the earliest and most important diagnostic symptom.

DR. CAILLÉ.—My views on this subject may be illustrated somewhat as follows: Dr. Northrup has named four symptoms, and the speakers who followed him have named a number of other symptoms, some or all of which are supposed to be characteristic of tubercular meningitis. Now, I look upon the whole question in a totally different light, and I take it that the symptoms under discussion are the usual ones of a group of pathological conditions which we class under the heading of encephalo-meningitis.

The etiology of encephalo-meningitis embraces a variety of causes, among which the following are prominent:

1. The poison of cerebro-spinal meningitis.
2. The poison of septicæmia and pyemia.
3. The extension of a neighboring inflammatory process (ear, nose, panophthalmitis), or intracranial abscesses and tumors.
4. The tubercle bacillus.

The tubercular meningitis occurs rarely as an acute disease. It is usually subacute. It is well known that it will run along three or four weeks, when improvement will take place, the young patient will gain in weight and strength, but subsequently go under from the same disease. I am bold enough to say that in many cases I would be able by studying the symptoms closely to distinguish between reflex troubles resembling encephalo-meningitis and actual cases of this disease. But I know of no symptom which would lead me to make a firm and positive diagnosis of tubercular meningitis, although the element of heredity would be an important guide to formulate a satisfactory conclusion.

DR. FRUITNIGHT.—As germane to the subject and introductory to what I have to say, I will briefly report a case seen last week. It illustrates what Dr. Jacobi has said, that in early infancy tubercular meningitis is likely to run an atypical course. The patient was a female aged eleven months, and the occasion of my being summoned was persistent vomiting. After questioning the mother, I learned that for ten or twelve days the baby had been restless, followed by an apathetic state. The day I saw her she was vomiting at frequent intervals. The vomiting was projectile. There was some retraction of the occiput, erythema, fugax of face and frontal region was present. There was hereditary taint on the maternal side. The temperature was 105° to 106°. I saw the child on three successive days, and on the third it died in convulsions. No

autopsy was made, but the symptoms taken in connection with the family history led me to make the diagnosis of tubercular meningitis. Like this case, the physician is not apt to see the patient during the early stage; it is during the second stage that he is called, when the symptoms named by Dr. Northrup have been developed. If a history of hereditary taint be co-existent, the diagnosis can then be readily made. At this period in the history of the case, however, the symptoms cannot be considered as early.

Dr. Rotch.—I wish to say that I think we owe a great deal to Dr. Northrup for the admirable way in which he has presented this subject. The manner in which he brought out the cases of entero-colitis was of especial value as showing how this disease may simulate a cerebral affection. There were one or two other points of particular interest. With regard to tubercular meningitis in young babies, it is much more apt to be acute than in older children. Not long ago a prominent physician of Stockholm published cases distinguishing between tubercular meningitis in young and older children. The cases were rather acute in character. Then, as to the history, we cannot depend entirely upon that nowadays, when the tubercle bacillus is coming to be recognized as playing so important a part. There seem to have been some cases in which infection must have come through the nurse, not by nursing, but because she was a tubercular subject.

The President.—In New York City, tubercular meningitis is not an uncommon disease in the tenement houses and in the asylums, and is of course fatal. Besides this malady, cases of cerebro-spinal fever, or, as it is designated by some, cerebro-spinal meningitis, are also occurring, and at times are more frequent than those of tubercular meningitis. It is often difficult to diagnosticate these two forms of meningitis on their commencement from each other, and from certain other diseases. In diagnosticating them from each other, I have heretofore attached much importance to the fact that tubercular meningitis usually begins gradually preceded by signs of failing health, whereas cerebro-spinal fever begins abruptly, but there are cases in which it is difficult to determine which form of meningitis is present until they have been under observation some days; that is, the history aids in the diagnosis. If death occur early, we may not be able to determine the kind of meningitis. On the other hand, if the patient recover, we assume that the disease is not tubercular meningitis, but cerebro-spinal fever.

Again, both these forms of meningitis may be mistaken for other acute diseases, and other acute diseases for them. Within

a week I have seen a child of about two years with mild cerebro-spinal fever, that was at first supposed by an experienced physician to have rheumatism, on account of pain when it was moved, and recently I have seen a case of very grave adynamic cerebro-spinal fever that the physician in attendance believed in the first days to be typhoid fever. In my opinion the diagnosis of typhoid fever should not be made hastily, and from observing a few symptoms which are thought to be characteristic, but from a deliberate weighing of all the symptoms that are present, and from observing the progress of the case. The presence or absence of headache, intolerance of light, oscillation, inequality or dilatation of the pupils, strabismus, sighing, vomiting, constipation, and the *tâche cérébrale* must be noted, and probably more than one examination will be required before we can pronounce positively as to the nature of the sickness.

Dr. Northrup, in closing the discussion, said, It was not the discussion of individual cases which I had hoped would be brought out to-day in response to my question. The individuals in this room represent vast clinical observation. We are now discussing a disease which is common, as all admit; one very difficult of diagnosis; and I did not care to have individual cases brought up so much as to elicit discussion on any four diagnostic points on which the members placed most reliance in diagnosis.

I saw immediately after I had read my paper that it had produced an influence like a red rag, and instantly Professor Earle lowered his head and charged. I knew he would, and I am glad he did. He certainly answered my questions on the four points. Many of those points have been taken up by others also, and I do not desire to intrude further upon the time of the meeting. I said all I had to say in the paper; it expresses my convictions, and I simply hope that the report of the meeting would contain a consensus of judgment which would be of value. I am surprised that Professor Rotch has given a negative answer to the questions. He says the diagnosis cannot be made on four symptoms in the first two years of life.

A word or two with regard to the four points I have named. I do not wish to change them, but to emphasize what Dr. Winters has said, on the importance of watching the early stage. A child begins to vomit and tends to sleep a good deal. Now, vomiting with drowsiness is very common among children. Yet on close observation, and taken in connection with the other symptoms, it becomes very significant. The point made by Dr. Jacobi, with regard to

low temperature, I do not undervalue, but I was unable to get it into my list of four. In the histories of my cases I purposely put in the temperature, and in one, to show its course, stated that on one day it rose to 105° F. That, of course, confused the diagnosis, but it was my duty to give it as the case came to me, omitting none of the facts.

In conclusion, I repeat that I consider these the most reliable four early symptoms for the diagnosis of tubercular meningitis in infant life.

THE MANAGEMENT OF HUMAN BREAST-MILK IN CASES OF DIFFICULT INFANTILE DIGESTION.

BY T. M. ROTCH, M.D.,
Boston.

INSTANCES have continually been brought to my notice where infants have either been allowed to continue with their mothers' milk when they were not thriving on it, simply because it *was* mother's milk, and, on the other hand, have been weaned from their mothers for what would evidently be insufficient reason had the case been thoroughly understood. In both instances a proper knowledge of what can be done with breast-milk—that is, with the management of its different constituents, increasing or decreasing their relative proportions—would have been of benefit to both mother and child, and in the latter case at times was simply a question of mortality. This lack of knowledge, or, I should say, lack of adapting the small degree of knowledge which we possess of this branch of medicine, is, to say the least, reprehensible, and in other branches of our art, which are more intelligently and carefully studied, would be deemed inexcusable. Physicians are continually stating to their patients that human breast-milk is the best food for infants, and yet continually exhibiting their ignorance concerning, or neglecting to follow, the very principles which make their statements true. First, then, we, as practical physicians, should at once understand, agree to, and state that when we speak of the superiority of breast-milk as a food we mean good average breast-milk, and for the average

infant. It would seem that, considering how important it is to start young human beings well in life, and how frequently this start is handicapped by immediate overtaxation of their digestive function, a brief statement of what is known concerning human breast-feeding would not be out of place at this meeting.

I hope, also, that the results of my own individual work in this direction, during the past two years, may not be uninteresting to you. Remember that we are working clinically in the nursery; that our knowledge of breast-feeding is not exact, and hence our results are liable to be failures. We are groping, as it were, after the truth in our investigations of breast-feeding. Our knowledge of it and our accuracy with it does not compare with that of artificial feeding. Hence it is more of an unknown ground; hence interesting; and hence most worthy of the attention and discussion of this society.

The breasts of all mammals that suckle their young, are elaborators, producers; they are not storehouses for preserving sustenance for the infant until it is needed; they are beautifully-constructed mills, turning out, when demand is made for it, a product which has been directly moulded within their walls, from material which has been brought to it and through its portals from various parts of the economy; a compound racemose gland, lined with glandular epithelium, which acts as so much delicate machinery to form sugar and fat and albuminoids, and these are mixed with water and salts from the blood. The epithelial cells are so finely organized, so sensitive with their minute nerve connections, that changes of atmosphere, changes in food, the emotions, fatigue, sickness, the catamenia, pregnancy, and many influences, in fact, throw their mechanism out of gear most readily, and change essentially the proportions of their finished product. Then, again, this delicate mechanism adapts itself as to the bulk of its product, elaborating a smaller or greater supply according to the age and again to the size of the consumer. The same breast will either supply the proper amount for the average infant of a certain age, or the greater amount for the same age but greater gastric capacity of the infant above the average devel-

opment for its age; or, again, the greater amount required for both these infants when they are some months older. Again, this machinery is regulated as to the time which it requires at different ages of the consumer to produce the average qualitative food, a shorter interval of feeding being needed for the younger and a longer interval for the older infant, so that a neglect, on the part of the mother, to adhere to the proper intervals for using the machinery results in decided qualitative changes. Thus a prolonged interval lessens the solid constituents in their proportion to the water, while a shortened interval, by exciting the epithelial cells to frequent work, overstimulates them, with the result of increasing the solids in their proportion to the water. In fact, too long intervals produce a too dilute product, while too short intervals produce a too concentrated product. We know that there are a variety of salts in the finished product of the mammary gland, and we infer that these salts have a certain definite proportion to each other, from our knowledge of the product of the cow's mammary gland; as yet, however, the chemist has failed to impress us with the belief that we have a sufficiently exact knowledge of the proportions which the different constituents of the total salts hold to each other, for us to attempt to make any practical deductions concerning them. We therefore speak of them as a whole under the title of ash. The analysis, also, of large numbers of breast-milks, at different periods of lactation, shows us that not only the constituents vary from month to month, and even from day to day, but that this variation takes place to as great a degree in the early as in a later period of lactation, so that we are not warranted in assuming that the milk grows stronger as its age increases. The mammary gland acts both as a secretory and an excretory organ, so that it cannot be classed as a metabolic tissue, in the limited meaning we now attach to these words.

Yet the metabolic phenomena,* giving rise to the secretion of milk, are so marked and distinct, and have so many analogies with the metabolism which we meet with in adipose tissue, that we must look upon it chiefly as a secretory organ,

* Forster's "Physiology."

within, however, certain limits, for we, of course, know that, at times, foreign elements may be excreted from the gland, to the detriment of the consumer. This at once opens up the interesting question, When is the mammary gland most likely to have what we might call its normal secretory function interfered with and assume temporarily the function of an excretory organ? This apparently takes place both before the mammary gland has attained its equipoise, so to speak, as during the colostrum period, and later, when any of the above-spoken-of influences occur, affecting the mother's general condition, such as sickness, emotion, etc. In these latter instances we find the milk returning to the colostrum period,—that is, we assume that the chemistry of that early period of lactation, which essentially represents a condition of lack of equipoise, is a condition of double function, partly secretory, partly excretory. The greater the excretory function of the gland becomes at any time in proportion to the secretory, the more abnormal will be the finished product, while the nearer the gland approaches to a purely secretory organ, the more perfect and normal the product. The mechanism of the mammary gland, therefore, is in its most perfect condition after the colostrum period has ceased, and when the general organism, both physical and mental, is in a state of rest, by rest meaning freedom from causes detrimental to a perfect metabolism. The chemistry of this equipoise and lack of equipoise of the mammary product appears to be closely connected with the albuminoid element. This element is known to be a compound one and decidedly complex, but, for purposes of illustration, we can safely say that the word albuminoids is a general term, which includes casein and albumen, also that these factors of the complete whole vary in their proportions to each other, according as the mammary function is, or is not, in a state of equipoise. In the colostrum period also, and probably in its analogous periods of sickness, emotion, etc., the albumen is in excess proportionately to the casein, while as the equipoise of the function becomes more complete, the casein is increased proportionately to the albumen. Probably at the end of lactation, as in the beginning, we shall find this same condition of richness of albumen and deficiency of

casein. In the beginning, then, of lactation, during lactation, when normal metabolism is interfered with, and as lactation draws to a close, we have analogous conditions, in which the mammary gland, instead of being a normal secretory organ, becomes abnormal and a more or less excretory organ. During these periods we should be careful not only to avoid giving drugs to the mother which might be eliminated by the milk, but should also closely watch the infant for signs of digestive disturbance, which may be at once corrected by withdrawing for a time the mother's breast.

DIAGRAM I.—HUMAN BREAST-MILK.

	Normal Average.	Rotch's Working Basis.
Fat	4.	3–4.
Albuminoids	1–2.	1–3.
Sugar	7.	6–7.
Ash	0.2	0.1–0.2
Total solids	12–13	10–14
Water	88–87	90–86
	100–100	100–100

I have given the figures representing the average breast-milk according to large numbers of analyses, made by the latest and most improved methods, as recommended by the most noted milk analysts of the world,—that is, they represent the average figures.

Beside these figures I have placed the figures usually returned to me in cases where the infants have thriven.

The methods of analysis were the same in mine as in the average cases, and represent the work of experts trained for this especial chemical research. (As, I suppose, this society consists more purely of clinical investigators than chemists, I take it for granted that my illustrative figures will be accepted as correct, and that the question of methods of analysis need not be further spoken of.) Strange as it may seem, the unquestioned value of the milk analysis in clinical medicine is, as a rule, overlooked.

Ten or twenty dollars spent for three or four analyses will, in a very large number of cases of difficult infantile digestion,

render an obscure case clear, relieve the mind of the physician, and enable him to at once adopt the proper line of treatment.

The milk analysis simply shows *what* the infant is taking into its stomach, and which part of the food is producing the unfavorable symptoms.

The treatment is simply knowing the error in one or more constituents of the food, to change them either to the normal average, or below it, until the digestive functions have recovered their equilibrium. In order to obtain a fairly correct and at best only proximate knowledge of what the especial infant is taking into its stomach, when nursed at regular intervals, according to its age, the proper method of obtaining the specimen to be analyzed should be carefully attended to.

From what has just been said concerning the influence of short or long intervals and the proportions of the different solids at the beginning (fore-milk) and end (strippings) of the nursing, we at once see that the milk for analysis should either be the total amount which the breast contains, or it should be taken in the middle of a nursing. Thus, if it is found that the infant takes twenty minutes to empty the breast, we should allow it to nurse five or six minutes. We should then take our specimen for analysis, calculating as well as we can from the total amount which the age and weight of the infant indicates as being in the breast, and taking a larger or smaller amount so as to not get the nursing of the last five or six minutes, namely the strippings.

DIAGRAM II.—HUMAN BREAST-MILK.

	"Strippings." (Two hours interval.)	"Fore-Milk." (Twelve hours interval.)
Total solids	15.32	10.14
Water	84.68	89.86
	100.00	100.00

This diagram represents the importance of these rules. The chemist needs from one to two ounces of milk, preferably the latter, for his analysis.

I have had a large number of breasts, in private practice

especially, but also in the hospitals, pumped for analysis, and have found this simple apparatus—the Altina breast-pump, which I now show you—as successful and as free from harm as any. The objection made by some physicians, especially in the hospitals, to pumping the breasts is that they fear mammary abscess. I have never seen this result from the pump in private practice, and should judge that, with careful and gentle manipulation, it must be rare. As my allotted time will not permit me to cite numerous cases of breast-milk management, I shall simply present to you diagrams which will each represent a particular class of cases, which have appeared to me to be of interest and importance. First, however, what do we know of those causes which change the proportion of the solids to the water in milk, which can be practically made use of in our endeavor to make these changes, when we attempt to manage the milk? A sedentary life, with abundance of rich mixed food (provided the woman has a strong healthy digestion), appears to increase the total solids and decrease the water. This increase is almost always in the fat and albuminoids rather than in the sugar and ash; in fact, the marked variations in human breast-milk are almost always shown in the fat and albuminoids. Hence our attention must almost invariably be directed to correcting the fats and albuminoids. This is fortunate, as we know of no especial treatment, except on very general principles, by which we can alter the proportion of sugar or salts to the other constituents; in managing human breast-milk, then, we treat almost universally the fat and the albuminoids. A meat or rather nitrogenous diet in the woman increases the fat in her milk. Our knowledge of physiology also indicates that much fat eaten by the woman tends rather to lessen the fat in her milk. Hence, to increase the proportion of fat in a woman's milk, give much meat and only a moderate amount of fat. The albuminoids are more difficult to deal with; they have a tendency to increase both in very poor, very bad, and very rich milk. The problem with them which we have to solve is almost always how to decrease them, no matter what the milk is. Our knowledge, unfortunately, concerning a sure means of reducing the albuminoids is very limited. Practically, however, I have found that where the

woman is in good health, it is physical exercise which we must insist on, preferably walking in the open air, and within the limits of fatigue. An average of from one to two miles twice daily I have found to be about what the average healthy woman in New England needs to reduce her albuminoid percentage.

We can now discuss these illustrative diagrams intelligently, and I ask for free criticism of this important and complex subject, for I am myself, with all humility, simply groping after the truth, and I have learned much from my failures as well as from my successes. It is the successes, however, which must encourage us to go on seeking after the truth.

DIAGRAM III.

Represents typical analyses of normal, poor, overrich, and bad human breast-milk.

	Normal. (Healthy life as to exercise and food.)	Poor Milk. (Starvation.)	Overrich Milk. (Rich feeding; lack of exercise.)	Bad Milk. (Pregnancy, disease, etc.)
Fat	4.	1.50	5.10	0 80
Albuminoids	1–2.	2.40	3.50	4.50
Sugar	7.	4.00	7.50	5.00
Ash	0.2	0.09	0.25	0.09
Total solids	12–13	7.99	16.35	10.39
Water	88–87	92.01	83.65	89.61
	100–100	100.00	100.00	100.00

DIAGRAM IV. (HUMAN BREAST-MILK)

Shows the influence of a luxurious life on a poorly-fed but healthy wet-nurse.

	Normal.	Two days before change of food.	Rich food and but little exercise for a month.	Food and exercise regulated.
Fat	4.	0.72	5.44	5.50
Albuminoids	1–2.	2.53	4.61	2.90
Sugar	7.	6.75	6.25	6.60
Ash	0.2	0.22	0.20	0.14
Total solids	12–13	10.22	16.50	15.14
Water	88–87	89.78	83.50	84.86
	100–100	100.00	100.00	100.00

DIAGRAM V.

Shows the effect of the catamenia on human breast-milk.

	Normal.	Catamenia. Second day.	Seven days after catamenia.	Forty days after catamenia.
Fat	4.	1.37	2.02	2.74
Albuminoids	1–2.	2.78	2.12	0.98
Sugar	7.	6.10	6.55	6.35
Ash	0.2	0.15	0.15	0.14
Total solids	12–13	10.40	10.84	10.21
Water	88–87	89 60	89.16	89.79
	100–100	100.00	100.00	100.00

DIAGRAM VI. (HUMAN BREAST-MILK)

Shows a bad milk, and one which was impossible to manage on account of the continual recurrence of the same cause, uncontrolled emotions.

	Normal.	Emotions causing disturbance in infant's digestion.
Fat	4.	0.62
Albuminoids	1–2.	4.21
Sugar	7.	5 80
Ash	0.2	0.20
Total solids	12–13	10.83
Water	88–87	89.17
	100–100	100.00

DIAGRAM VII. (HUMAN BREAST-MILK)

Shows a milk possible to manage because the mother, though excitable, was able and willing to control her emotions.

	Normal.	Baby doing badly, colic, etc. Mother before treatment.	Baby doing well. Mother after treatment.	Wet-nurse provided but not used.
Fat	4.	1.62	3.20	3.04
Albuminoids	1–2.	3.54	2.52	2.32
Sugar	7.	6.10	6.40	6.60
Ash	0.2	0.17	0.18	0.12
Total solids	12–13	11.43	12.30	12.08
Water	88–87	88.57	87.70	87.92
	100–100	100.00	100.00	100.00

In the above case the mother was very nervous, and wished to nurse her baby, but thought that she could not, as she had been discouraged by her nurse and physician.

She was then told that she could nurse in a week, if, in the mean time, she took proper food and exercise and withdrew the baby from the breast. This she did, and had her breasts regularly pumped with the above result.

DIAGRAM VIII. (HUMAN BREAST-MILK)

Shows how a milk can be managed while the nursing is continued.

	Normal.	Baby two weeks old with serious general nervous symptoms and pain. Mother eating much meat and taking no exercise.	Mother walking and eating less meat. Baby entirely well.	Baby four months old with pain and diarrhœa. Mother not walking so much.	Baby doing well. Mother walking two miles daily.
Fat	4.	3.44	2.09	3.98	3.19
Albuminoids	1–2.	3.96	1.38	2.22	1.78
Sugar	7.	5.60	6.70	7.00	5.60
Ash	0.2	0.20	0.15	0.19	0.16
Total solids	12–13	13.20	10.32	13.39	10.73
Water	88–87	86.80	89.68	86.61	89.27
	100–100	100.00	100.00	100.00	100.00

As seen above, the baby did not do well until the mother began to exercise, and at four months was again affected by apparently the high percentage of albuminoids. The baby was considerably under the weight corresponding to that of the average baby of four months. It was found to nurse twenty-five minutes at a time, and by calculation, from weighing before and after nursing, it was found to take from twenty to thirty drachms. This amount being larger than the probable size of its stomach demanded, the time of the nursing was reduced to twenty minutes, and five drachms of sterilized water were given in the middle of the nursing, thus changing the percentages in the milk to the figures which are represented in the last column. This calculation is on the basis of twenty-five drachms to each nursing.

So long as this method of feeding was adhered to the baby did well. It was evidently a case where the baby could not digest over two per cent. of albuminoids.

DIAGRAM IX. (HUMAN BREAST-MILK)

Shows a milk in which the albuminoids, which were disturbing the infant, could not be reduced until the mother was made to walk comfortably and thus without fatigue.

	Normal.	Infant with colic and vomiting. Mother taking no exercise and very rich food.	Infant as before. Mother walking two miles daily, but having blisters from French shoes.	Infant doing well. Mother walking two miles. Easy shoes, no blisters.
Fat	4.	3.05	0.65	3.34
Albuminoids	1–2.	3.89	3.82	2.61
Sugar	7.	6.10	5.25	6.30
Ash	0.2	0.16	0.18	0.16
Total solids	12–13	13.20	9.90	12.41
Water	88–87	86.80	90.10	87.59
	100–100	100.00	100.00	100.00

DIAGRAM X. (HUMAN BREAST-MILK)

Shows the value of retaining the breast-milk by managing even an unpromising case.

	Normal.	Infant with colic and failing. Mother no exercise, nursing irregularly, irregular and improper sweet food. Nervous, worried condition.	Infant put on bottle. Breasts pumped every four hours, moderate exercise, one mile. Full regular diet, tranquil.	Exercise increased to two miles. Small amount of meat.	Eating much meat. Exercise the same.
Fat	4.	0.34	3.24	2.79	4.84
Albuminoids	1–2.	3.61	3.95	3.66	3.42
Sugar	7.	5.40	5.45	5.05	6.00
Ash	0.2	0.18	0.16	0.20	0.17
Total solids	12–13	9.53	12.80	11.70	14.43
Water	88–87	90.47	87.20	88.30	85.57
	100–100	100.00	100.00	100.00	100.00

The above represents a bad milk from the failure of the healthy mother to conform to the rules of lactation. This bad milk represented in the second column had to be made into a rich milk by regular feeding before any attempt could be made to alter the constituents. The albuminoids were then reduced somewhat by exercise, and after the breasts had been pumped for two weeks, the analysis showed the percentages as represented in the last column. The milk was then diluted with sterilized water by the same method as was explained in

Diagram VIII., and the baby was put to the breast and did well; in fact, was carried through an attack of retro-pharyngeal abscess with this breast-milk.

DIAGRAM XI. (HUMAN BREAST-MILK)

Shows that even for a long interval the breasts may be pumped and the result be a successful nursing.

	Normal.	Baby showing nervous symptoms and much uric acid. Mother no exercise, much rich food.	Baby showing no uric acid and thriving. Mother walking two miles and not eating much meat.
Fat	4.	5.71	2.67
Albuminoids	1–2.	4.29	3.18
Sugar	7.	4.00	6.60
Ash	0.2	0.19	0.17
Total solids	12–13	14.19	12.62
Water	88–87	85.81	87.38
	100–100	100.00	100.00

In this case the baby was withdrawn from the breast temporarily, and the breasts pumped twenty-seven days.

When the analysis presented the figures seen in the last column, the milk was treated as in Diagram VIII., and the baby put back to the breast.

DISCUSSION.

DR. JACOBI.—In reply to your invitation to discuss this paper, Mr. President, I may say there seems to be little room for discussion. These figures speak for themselves. It is a satisfaction to me that Dr. Rotch has had the interest which he has shown for years in the study of breast-milk and artificial feeding, and that he has made his studies so exact. It may be known to some of those who have read my contributions to this subject the past twenty or thirty years that I have always insisted, inasmuch as the albuminates are increased when there is anything wrong with the mother's milk, upon mixing with it some additional liquid. Seldom have I used water, sometimes sugared water, but usually farinaceous decoctions. My satisfaction is that the author has taken the trouble and has found the time to work up the subject so exactly, and that the facts which so accurate an observer has collected have confirmed my own position.

DR. HOLT.—It has long seemed to me that physicians were accustomed to order the mother to stop nursing her child sometimes for very slight reasons. Nursing is so important that in every case the subject should be thoroughly investi-

gated before ordering a change. The question of the mother's ability to nurse the child is sometimes the question of the child's life itself. Dr. Rotch's work is in the right direction, and I am very glad the subject has been brought before this meeting. It has long seemed to me that much could be done in an accurate and careful way which has not heretofore been attempted, and the results which Dr. Rotch has obtained ought to stimulate us all to more careful study in this direction. Instead of saying to a mother in an arbitrary way, "It is impossible for you to nurse your baby; get a wet-nurse, or give it the bottle," we should study the case as carefully as we would any other difficult problem in medicine before reaching a conclusion.

Dr. Fruitnight.—It seems to me that this paper is a very realistic protest against the usual way physicians have of condemning mother's milk. We know it to be the custom of many physicians to take a little of the mother's milk in a glass, and in a perfunctory manner look at it, observe that it is blue, or pale, looks thin and watery, and immediately order the mother to discontinue nursing. I think the position taken by Dr. Rotch—that the practitioner should analyze the milk before giving such advice—is the right one.

Dr. Blackader.—I have nothing to say further than to express the satisfaction which the paper has given me. Having already been acquainted with the author's views, I applied them in several cases this summer, cases in which I had every reason to believe the albuminates were increased, and in which, under my directions, the children thrived on the mother's milk, notwithstanding other physicians had ordered a change. Dr. Rotch has stated that a high diet is apt to increase the albuminates. It has seemed to me that in dispensary cases the taking of a large quantity of tea introduces a nervous element and has a similar result. I often find mothers taking six or seven cups of tea, usually green tea of the poorer quality, during the day, and on prohibiting it the babies begin to thrive.

Dr. Rotch.—I thank the gentlemen for the courteous remarks which they have made. They will have many failures in applying these more exact methods. I have spoken of the successes. We cannot expect simply by following out these rules to be able to manage the milk in every case. But I do think it is worth while to continue the study. There seems to be a prevailing opinion that when human breast-milk contains more than one per cent. of albuminoids the child cannot thrive. This is not so; there is no fixed rule. Infants sometimes thrive when the albuminoids reach three per cent. Each case constitutes a rule unto itself.

SUMMER DIARRHŒA IN INFANTS: BEING AN ANALYSIS OF THE CASES TREATED AT THE SEA-SHORE HOME DURING THE SUMMERS OF 1887, 1888, AND 1889.

BY CHARLES W. TOWNSEND, M.D.,

Boston.

THERE are no diseases occurring among infants whose treatment is more perplexing than that of the diarrhœal diseases which every summer play such havoc among the residents of large cities. The Sea-Shore Home at Winthrop receives from Boston during the summer months infants suffering from these diseases, and my endeavor in this paper will be to analyze the cases of the last three years, in order to arrive, if possible, at some conclusions as to methods of treatment. Although the number of cases is not large, my excuse for offering this report to your consideration is the fact that careful records were kept of each case, including daily record of weight, and thus my conclusions are obtained as much as possible from definite data, and not from general impressions which are apt to be so misleading. For these records I am greatly indebted to my house-officers, Dr. A. C. Stannard, Dr. A. S. Thayer, and Dr. E. J. Tilton, to whom I wish to express my thanks, and also to the sisters of St. Margaret, who have so intelligently conducted the nursing.

The diarrhœal diseases I have, for the sake of convenience, divided into three forms, which I shall define rather arbitrarily: first, cholera infantum, meaning by that an acute, probably specific, and general disease characterized by profuse watery purging and vomiting, and a high temperature, running a rapid course, and ending in death or recovery in from twenty-four to seventy-two hours. Second, gastro-intestinal catarrh, a disease characterized by vomiting and diarrhœa, the vomiting and stools often containing mucus. The temperature is either normal or slightly elevated, and the disease lasts from a few

days to months. Third, intestinal catarrh, in which the intestines are alone affected.

Let me here enter my protest against the loose way in which the term cholera infantum is used, even by physicians who know better, and let them not refer to intestinal catarrhs that have lasted for weeks as cases of this disease.

During the three summers there were 236 cases of diarrhœal diseases at the Home, of which, 11, or four and a half per-cent., were classed under the head of cholera infantum; 77, or thirty-two and a half per cent., were cases of gastro-intestinal catarrh; and 148, or sixty-two per cent., were cases of intestinal catarrh.

Cholera infantum (11 cases).—Of these, 7, or sixty-four per cent., died. Four died within eight hours of entrance, being admitted moribund. The duration, both in the fatal and non-fatal cases, was fifty-one hours, omitting one case, where active symptoms ceased on the second day, but where death ensued on the ninth day from gastro-intestinal catarrh and collapse. The temperature was recorded in five cases, reaching in all 105° F. or over, in one case 107° F.

The four cases that recovered began after an interval of one to four days to rapidly gain in weight; the average daily gain for five and one-third days for all these cases was found to be as much as ninety grammes (three ounces). This would serve to emphasize the fact that cholera infantum is a disease without appreciable local lesions; and although it may be followed by gastro-intestinal catarrh, which may prove fatal (as in the case noted above), it may, on the other hand, be promptly and entirely recovered from.

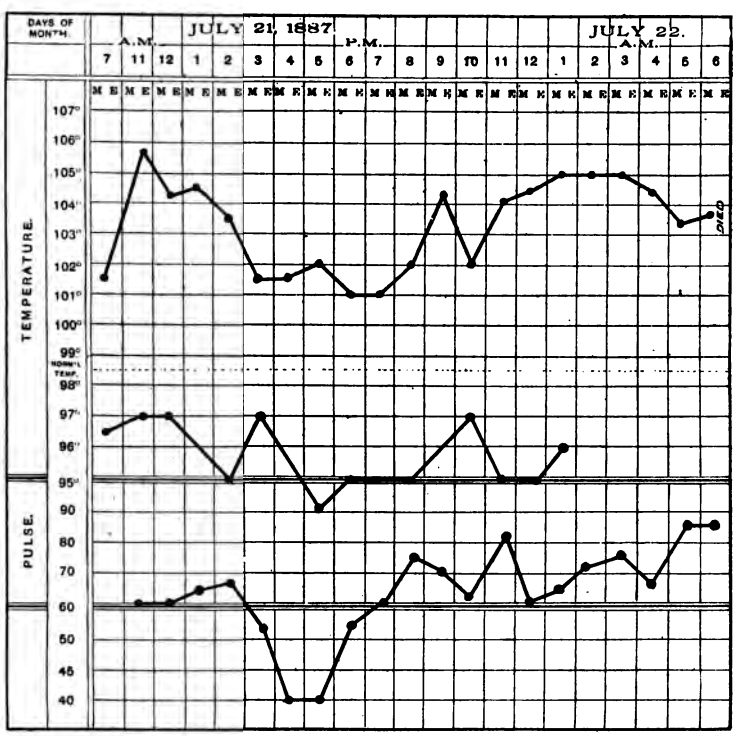
All of the fatal cases and two of those who recovered were on the bottle; the two others who recovered were partly nursed and partly fed artificially.

The average age of the cases was eight months; the extremes being three and twelve months for those that recovered, and one and a half and twenty months for those that died.

The treatment was essentially the same in all the cases, namely, brandy by the mouth in large and frequent doses, and occasionally subcutaneously; the application of warmth by means of hot-water bottles to the extremities; of cold to

the head, where this was indicated, and the administration of water in large quantities, to make up for the drain on the blood caused by the watery discharges. White of egg and beef-juice were also given as soon as they could be borne.

During the first summer, two cases of cholera infantum began at the Home, due unquestionably to the fact that the food was not sterilized. In the last two years the food has been sterilized, and since then no case has arisen at the Home. These two cases are very instructive. Both children had entirely recovered from intestinal catarrh, and were gaining weight on a diet of milk and barley-water; in both the attack was suddenly ushered in by profuse watery purging and vomiting, both went into a rapid collapse, had convulsions, and died in twenty-four hours. The hourly temperature chart of the child, aged twenty months, is here given.



Gastro-intestinal catarrh (77 cases)—*Intestinal catarrh* (148 cases).—Of the former, 37 were discharged well, 20 relieved, 14 not relieved, and 6 died. Of the latter, 121 were discharged well, 23 relieved, 4 not relieved, none died.

Observations on temperature.—In 79 cases temperature charts were kept, and out of 37 cases of gastro-intestinal catarrh, the temperature remained normal in 14; in 4 the temperature rose once or twice to 100° F.; in 7 it ranged from 99° to 100° for several days; and in 6 it occasionally went as high as 103°, returning to 99° or 98°.

Of 42 cases of intestinal-catarrh, the temperature remained normal in 28 cases; in 5 it occasionally rose to 100°; in 7 it continued for two or three days between 99° and 100°; and in 2 it rose once from normal to 103°. There was, in fact, no regularity in the temperature charts, as in cases of cholera infantum, and it was of but little value in prognosis. Although, as a rule, the sicker the case the more apt was the temperature to be occasionally elevated, still some of the sickest cases had normal temperature. It does not seem possible, therefore, to distinguish a "simple diarrhœa" from intestinal catarrh by absence of an elevation of the temperature.

With reference to the important subject of treatment, I have carefully analyzed the cases, taking into consideration the number and character of the dejections and vomitings, and the daily weight of the patients. An analysis of this sort is very difficult, owing to the fact that the cases differ so, no two being exactly alike; there is also great danger of falling into the *post hoc propter hoc* fallacy. It would, for example, be useless to compare the results in those given drugs and in those without such treatment, for the latter were generally the mild cases.

All the cases had the advantage of the change of air from the hot crowded city to the country; and the good effects of this alone were in many cases very marked, resulting in a speedy recovery in some of the very mild cases,* and in a marked improvement in many of the severe cases. But it is evident that

* The Sea-Shore Home is situated in the middle of the peninsula of Winthrop, about a mile distant from the ocean on one side and Boston harbor on the other.

a change in the air alone is not sufficient for the cure of any but the most transitory cases.

A change of diet was found to be the most important of all considerations, for in all some defect in the quality or quantity of the food given previous to entrance was found, the most marked defect being that the food was generally far from fresh or sterile, as was easily discovered by an examination of the bottles brought with the patients.

DIET.—During the second and third summers all the bottle-foods were systematically sterilized by steam, and the benefit obtained, as seen in the more favorable progress of the cases, was evident.

Breast-milk.—In 35 cases the infants were partly or wholly breast-fed. In 6 cases the breast-milk did not agree, in 29 cases it did agree, although in many of these the milk was evidently bad at first, as shown by the character of the stools and by the loss of weight in the infants; but later, as the mothers improved, with the change of air and diet and the freedom from household cares, the infants improved correspondingly.

Milk and lime-water, in varying proportions, were used in 39 cases. In 14 of these the mixture did not agree; in 25 improvement occurred during its use.

Milk and barley-water, in varying proportions, were used in 66 cases. In 17 it did not agree; in 49 improvement occurred during its use. Many of these were mild cases, and it was generally given to infants over a year old, where it was evident that the disease was of a transitory nature. Whether the same proportions of milk and plain water would not have done as well I do not know.

Peptonized milk was given in 11 cases, all rather severe, in 6 of which no improvement followed; in 5 there was improvement.

Modified milk mixture.—This, during the first summer, was the mixture of Dr. A. V. Meigs, consisting of cream (fifteen per cent.), 2 parts; milk, 1 part; lime-water, 2 parts; sugar-water (seventeen and three-quarters drachms of milk-sugar to the pint), 3 parts. After this it was given in the form recommended by Dr. Rotch, in the proportion of cream (fifteen per

cent.), 4 parts; milk, 2 parts; water, 9 parts; lime-water, 1 part; sugar of milk, 6¾ drachms to the pint of mixture. This latter mixture was variously modified to suit individual cases, by the reduction of the fat or of both fat and albuminoids. The mixture, in one form or other, was used in 75 cases, and, as a rule, in more severe cases than those in which milk and barley-water were given; 50 of these did well; 25 did not do well; but it was noticeable that the proportion of those with whom the mixture agreed increased in the last two years, owing partly to the fact that the food was sterilized and partly because the proportions of the food were differently arranged. I am, therefore, more and more satisfied with the use of this mixture, and can add that my results in private practice have been even more satisfactory. This difference is largely owing to the fact that, among the poorer class of patients, such as are taken to the Sea-Shore Home, many are to be found whose constitutions are so feeble that even with the best treatment they succumb to disease.

The only other forms of dietetic preparations used at the Home were beef-juice and white of egg in sterilized water. These were particularly useful in cases where vomiting was a prominent symptom; of 36 cases in which beef-juice was used, in 27 it acted well, in 9 it did not. The white-of-egg mixture was used in 23 cases, with good results in 16; without them in 7. Infants with severe gastro-intestinal catarrh were, as a rule, given beef-juice or that alternate with white-of-egg and water for twenty-four or forty-eight hours. At the end of this time the modified milk mixture was cautiously given in place of a few feedings of the beef-juice, was gradually increased, and the beef-juice diminished, until the latter was entirely replaced by the milk mixture. In a few cases the complete starvation plan was tried, of giving the baby water only for the first twenty-four hours, but it was not as successful as the above method, besides causing considerable anxiety and complaint on the part of the mothers.

Brandy was used in a large number of the cases, including all the severe ones.

Drugs.—Eighty-seven cases were treated without drugs, reliance being placed on diet, the change of air, and good hy-

gienic measures; 76 of these cases did well, 11 did not improve. The mild cases are, as a rule, included in this list, also some of the serious cases. Treatment by drugs was limited, with a few exceptions, to bismuth, salicylate of soda, and lactic acid, belonging to the class of antiseptics, and these were, I think, given a thorough trial.

Bismuth was used in 42 cases. In 25 cases no improvement occurred during its use, as shown by the character of the stools or by the weight of the infant; in some of these its administration was objected to by the infant, with the result of causing vomiting. In 17 cases improvement occurred during its use. In either case, it is to be remembered that dietetic and hygienic measures were also employed.

Salicylate of soda was used in 26 cases, being given in water in doses of two grains every two hours to an infant of a year. In 14 cases there was no improvement; in 12 cases improvement occurred during its use.

Lactic acid was given in 12 cases, in doses of a drachm of the two-per-cent. solution, at intervals varying from a quarter-hour to two hours. No effect was noticed in 6 of these cases; in 5 improvement occurred under its use.

Resorcin was given in 4 cases, in 3 without effect, in 1 improvement occurred.

As the cases differed so in degree of severity and in duration before entrance, it is impossible to draw exact conclusions from these figures; but, taking into consideration the number of cases that did well without drugs, I am inclined to be rather sceptical as to the value of these antiseptics in the treatment of summer diarrhœa. Their use in my hands has certainly not been followed by the brilliant results reported by some. This difference can perhaps be explained by the fact that my cases remained constantly under observation, and were not of the uncertain out-patient class where favorable results are too often wrongly inferred from the non-reappearance of the patient and partly from the fact that zeal for a theory of intestinal antisepsis may have warped these reported judgments in deciding on the benefit obtained.

On theoretical grounds, if I am not mistaken, intestinal antisepsis by means of the drugs used at the present time is

impossible without danger to life, and with the late views on the function of certain intestinal bacteria it would, even if possible, be inadvisable.

Lavage of the large intestine with tepid water was used in 13 cases. In 10 of these, improvement was certainly marked, in 1 there was temporary improvement only, and in 2 no improvement took place. The results in these few cases encourage me to continue this treatment, although, as the small intestine is not reached by the washing, it does not seem to me that we should expect too much from this treatment alone. Lavage of the stomach I have not employed.

Relapses were not uncommon, and I have often wondered whether the patients might not be reinfected or their recovery delayed by the presence of so many others suffering from diarrhœal diseases. Infection through the food was prevented by the process of sterilization. There has been a steady improvement in the three years in the quarters given to the patients as regards space and ventilation, and with this an improvement in the progress of the cases.

Observations on weight.—A daily gain in weight is of course a most favorable indication. Some of the infants were discharged well in the course of one or two weeks, gaining in weight daily, yet weighing less than on entrance owing to the large initial loss before the diarrhœa was cured. The subsequent gain in weight was generally irregular, being often interrupted for a day or two. In a few cases there would be no gain in weight, notwithstanding the cure of the diarrhœa. Of 160 cases, there occurred a gain in weight over the lowest point reached in 105; 55 lost weight, and did not regain any. The average daily gain among the former cases was 38.8 grammes; the largest average gain for any one patient being 134 grammes (four and a half ounces) daily for eight days. The average daily loss in these 105 cases, until the lowest point was reached, was 34.8 grammes; the largest for any one patient being 255 grammes daily for two days. The average duration of the loss of weight was four and a half days. In other words, the average infant, after treatment was begun at the Home, lost weight at the rate of 35 grammes a day for four and a half days, and then began to gain at the rate of 39 grammes daily.

Thirty-four, or one-third, of the cases did not lose weight, but began to gain at once.

Of 49 cases that did not gain weight, the average daily loss was 40.6 grammes, the greatest being 130 grammes daily for four days. The average stay of these cases at the Home was ten days. It is probable that many of these would have soon begun to gain weight if they had stayed longer, as 18 were considered well, diarrhœa and vomiting having ceased, and the stools showed that the food was well digested.

Of 6 fatal cases, the average daily loss was 29 grammes, the average stay in the hospital being 11 days.

A CONTRIBUTION TO THE CHEMICAL STUDY OF THE SUMMER DIARRHŒAS OF INFANCY.

BY VICTOR C. VAUGHAN, M.D.,
Ann Arbor, Michigan.

In a paper* published two years ago I stated that the micro-organisms which produce the catarrhal or mucous diarrhœas of infancy are probably only putrefactive or saprophytic in character, and that they prove harmful by splitting up complex molecules, and forming chemical poisons.

The truth of these statements are constantly being exemplified and made more manifest with every experimental study of the subject. Able and diligent bacteriologists—among whom, Booker, in this country, and Escherich, in Germany, deserve especial mention—have made careful study of the bacteria found in the intestines and stools in these diseases, and all agree that no specific organism has been found. In his first contribution,† Booker reported the isolation of eighteen varieties of bacteria, and in his second paper,‡ fifteen more species are added to the list. In true cholera infantum the proteus group of bacteria was found in fifteen out of nineteen cases, but in the ordinary diarrhœas there is no constancy

* *Medical News*, June 9, 1888.

† *Transactions of the Ninth International Medical Congress.*

‡ *Transactions of the American Pediatric Society*, 1888.

in the species present. Germs which are frequently found one year are rarely seen in the cases observed the next summer. This has been the experience of all who have studied the bacteria of the summer diarrhœas in infancy.

Last February, Dr. Booker kindly sent me tube-cultures of some of the germs which he has isolated. With three of these I have made some investigations which it is the object of this paper to report. These germs are the X, *a*, and A of Dr. Booker's list. Of these germs the doctor wrote as follows:

"X was found almost as a pure culture in the fæces of a fatal case of diarrhœa.

"*a* was strongly pathogenic when tested last winter.

"A was isolated last summer, liquefies gelatin, and belongs to the proteus group.

Beef-tea cultures of each of these germs were made, and kept in an incubator at 37° C. for forty-eight hours. At the expiration of this time these cultures were used for inoculating flasks of sterilized beef-broth. Eight flasks, each containing about ten ounces, were employed for each germ. These cultures were kept in the incubator at 37° C. for ten days. They were then twice filtered through heavy Swedish filter-paper. The second filtrate was allowed to fall into a large volume of absolute alcohol, feebly acidified with acetic acid. A voluminous, flocculent precipitate resulted in each case. After the precipitates had subsided the supernatant fluid was decanted. The precipitates were then treated with distilled water, in which those from X and *a* were soluble, while that from A proved insoluble. A large volume of absolute alcohol was again added, and the mixtures allowed to stand for four days. The precipitates from X and *a* completely subsided, leaving the supernatant fluids perfectly clear; but in the case of A the subsidence was not complete. The precipitates were collected by decantation and filtration on porous plates, and dried over sulphuric acid. These substances are proteid in composition, but differ from known proteids and from one another. That from X is slightly yellow, as seen deposited in the alcohol, but becomes grayish on exposure to the air. It is readily soluble in water, from which it is not precipitated by heat or nitric acid singly or combined.

It gives the biuret and xantho-protein reactions. It is precipitated by saturating its aqueous solution with ammonium sulphate, and therefore cannot be classed with the peptones. Sodium sulphate and carbonic acid fail to throw it down from its aqueous solution, consequently we must say that it is not a globulin.

This leaves us with no other choice than to place it among the albumens, but we must admit that it possesses properties which do not belong to the known albumens.

The proteid prepared from cultures of the germ *a* is, as seen under the alcohol, very light, flocculent, and perfectly white, but so soon as it is brought in contact with the air, it begins to blacken, and finally dries down on the porous plate in black scales.

It possesses the same general properties in regard to the action of solvents and other reagents which were found to be possessed by the proteid obtained from cultures of X.

The proteid of A is peculiar, inasmuch as it is practically insoluble in water.

These three proteids are highly poisonous. When injected under the skin of kittens or dogs, they cause vomiting and purging, and when employed in sufficient quantity, collapse and death. Post-mortem examination shows the small intestine pale throughout and constricted in places. The heart has been invariably, so far, found in diastole and filled with blood. The following brief notes from the record of experiments will illustrate the nature of the symptoms and the post-mortem appearances.

A small amount of proteid from bacillus X, dissolved in water, was injected under the skin on the back of a kitten about eight weeks old. Within one-half hour the animal began to vomit and purge, and death resulted within eighteen hours. The small intestines were pale, contracted in places, and contained a frothy mucus. The stomach was distended with gas and contained yellowish mucus. The liver was normal, the spleen and kidneys congested, and the heart distended.

Another kitten was treated with the proteid from bacillus *a*, dissolved in water. The vomited and fæcal matters in

this case were green. The animal died after fifteen hours, and presented appearances practically identical with those mentioned above.

A third kitten was treated with some of the proteid of bacillus A, suspended in water, and presented substantially the same symptoms and post-mortem appearances.

A fourth animal was treated in the same manner as the above with a proteid prepared from some canned meat. This was done as a control on the above experiments, and the kitten remained unaffected. This experiment demonstrates the fact that the poisonous properties are peculiar to the bacterial albumens.

Concerning the amount of one of these proteids necessary to produce a fatal result in the animals experimented upon, I have made a few experiments.

I injected under the skin on the back of a guinea-pig ten milligrammes of the dry-scale proteid from bacillus *a*. This caused death within twelve hours. Of two kittens treated with fifteen milligrammes, each of the *a* albumen, one died after forty-eight hours, and the other recovered after two days of purging and vomiting. Two dogs, of about five pounds weight, had each forty milligrammes, and after serious illness of two days' duration speedily recovered.

During these two days of vomiting and purging the dogs were constantly shivering as with cold, but the rectal temperature stood at from 102.5° to 103.5° F.

I was inclined at first to suppose that the poisonous effects were due to some ferment carried down mechanically with the proteid in the precipitation with alcohol; but aqueous extracts from the proteid of bacillus A, which is not soluble in water, were without effect upon animals; while small amounts of the albumen, suspended in water and injected under the skin, produced death. From this it would seem that the albumen is itself poisonous.

There has been in no case any sign of inflammation at the point of injection.

Plate cultures have been made from the proteids themselves, and from the blood, liver, spleen, and kidneys of some of the animals killed with the proteid, and these plates have remained

sterile, thus demonstrating that no germ has been introduced into the animal along with the chemical poison.

What conclusions may we draw from these facts when considered in connection with the results of the labors of Booker and Escherich? In order to avoid any waste of time, I will formulate my ideas in the following propositions:

(1) *There are many germs, any one of which, when introduced into the intestines of the infant, under certain favorable conditions, may produce diarrhœa.*

As has been stated, many different germs have been found in the intestines of infants suffering from summer diarrhœa, and we now find that three species of these are capable of producing chemical poisons, which induce effects substantially identical with the symptoms observed in the infants, and it is not unreasonable to suppose that many other of these germs produce similar poisons.

(2) *Many of these germs are probably truly saprophytic.*

A germ growing in the intestine does not necessarily feed upon living tissue. The food in the duodenum before absorption has no more vitality than the same material in the flask. Moreover, the excretions poured into the intestines from the body are not supposed to be possessed of vitality. A germ which will grow upon a certain medium in the flask and produce a poison will grow on the same medium in the intestine and produce the same poison, provided it is not destroyed by some secretion of the body.

(3) *The only digestive secretion which is known to have any decided germicidal effect is the gastric juice; therefore, if the secretion be impaired, there is at least the possibility that the living germ will pass on to the intestine, will there multiply, and will, if it be capable of so doing, elaborate a chemical poison which may be absorbed.*

There is no longer any doubt that the acid of the gastric juice has a marked germicidal effect upon many micro-organisms.

I have found that an exposure to a two-tenths-per-cent. solution of hydrochloric acid for half an hour will destroy Eberth's germ and two poison-producing bacilli which I have isolated from drinking water, which was believed to have

caused typhoid fever. Although the germicidal effect of this acid has not been tried on the bacteria under consideration, I doubt not that it will be found to be considerable.

The chief reason why the breast-fed child has a better chance for life than the one fed upon cow's milk lies in the fact that the former gets its food-germ free; but a second reason is to be found in the larger amount of acid required to neutralize the cow's milk, as has been pointed out by Escherich. The gastric juice is the physiological guard against infection by way of the intestines.

It is also possible that some of the secretions poured into the intestines have germicidal properties, or that the cells, in absorbing the poisonous albumens, may to a limited extent so alter them that they are no longer poisonous, or that in a perfectly normal condition the liver may be able to prevent these poisons from entering the general circulation without change. These are all possibilities which science at some time in the future will investigate.

(4) *Any germ which is capable of growing and producing an absorbable poison in the intestine is a pathogenic germ.*

It is not necessary that a germ be capable of growing and causing disease and death, when injected under the skin or into the blood, in order to establish its right to rank with the pathogenic germs. In the blood the organism is acted upon by a wholly different fluid from that with which it is surrounded in the intestine, and the germicidal properties of the blood have been unquestionably demonstrated.

(5) *The proper classification of germs in regard to their relation to disease cannot be made from their morphology alone, but must depend largely upon the products of their growth.*

As I have demonstrated in the first part of this paper, three micro-organisms, differing sufficiently to be recognized as of different species, produce poisons all of which induce vomiting and purging, and, when used in sufficient quantity, death. Morphologically these bacilli may not be closely related, but physiologically they are near akin.

If these deductions be true, we will try to avoid the introduction into the alimentary canal not only of the so-called specific pathogenic germs, but of all toxicogenic micro-organisms.

SOME POINTS IN THE ETIOLOGY AND TREATMENT OF THE DIARRHŒAL DISEASES OF INFANCY.

BY FLOYD M. CRANDALL, M.D.,
New York.

It is the object of this paper to present a few facts derived from the study of diarrhœal diseases of the past summer. They are drawn from the tabulated histories of one hundred and thirty-five patients seen in private practice and at two dispensaries,—the Northwestern Dispensary on the west side of the city and the Polyclinic on the east.

The classification employed is that of Dr. Holt's in Keating's "Cyclopædia." Of these cases, 69, or sixty-five and nine-tenths per cent., were of the dyspeptic type, mostly acute, and 46, or thirty-four and one-tenth per cent., were cases of entero-colitis. Diarrhœa marked by large serous passages was not uncommon, but there was no case of undoubted classical cholera infantum.

Ages ranged from one month to four years; 116 cases, or eighty-five and nine-tenths per cent., occurred under two years of age; and 70 cases, or fifty-one and one-tenth per cent., between the sixth and eighteenth month.

These percentages are very similar to those reported by other observers. Dr. Holt has reported 772 cases, of which, eighty-one and six-tenths per cent. occurred under two years. Dr. J. Lewis Smith has reported 573 cases, of which, ninety-three and seven-tenths per cent. occurred under two years. I have also to report 403 cases from my class at Bellevue Hospital in former years, making, with those of this year, 538. Of these, eighty-one and one-tenth per cent. occurred under two years, and eighty-eight and sixth-tenths per cent. under two and a half years. I have also collected 474 cases treated during the past summer at the Northwestern Dispensary, and 643 from the Bellevue Out-Door Departments, sufficient to make exactly 3000. Tabulation of the figures obtained from these various sources shows the following results:

First six months	418	cases,—	18.7	per	cent.
Second six months	873	"	29.1	"	"
Third six months	722	"	24.1	"	"
Fourth six months	514	"	17.2	"	"
Over two years	478	"	15.9	"	"
Under two years	2522	"	84.1	"	"
Between six and eighteen months	1595	"	53.2	"	"

Susceptibility to the disease would seem, therefore, to be almost limited to the first twenty-four months of life. The close correspondence of the percentages of the various observers with the total is very striking, and would seem to show that these numbers express the facts for New York City.

The first of these cases, a private one, developed on June 9. The first case appeared at the Polyclinic on June 18. It had developed June 10. Observations upon this subject were incomplete during June. The date of onset, after July 1, is shown by the following table:

	Dyspeptic.	Entero-Colitis.	Total.
July	36	12	48
August	17	7	24
September	13	7	20
October	8	4	12
November	1	0	1

Of the dyspeptic cases forty-three per cent. developed during the first twenty days of July, while of the inflammatory cases but thirty per cent. developed during the same period.

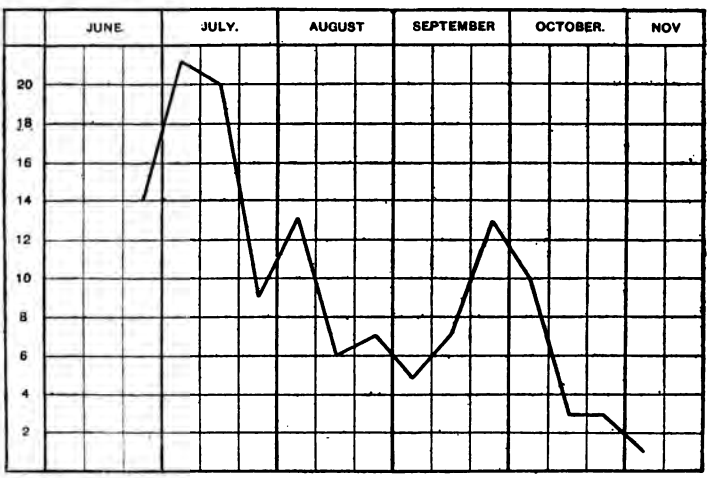
The disease was most prevalent during the first twenty days of July. There was then a very sudden and marked decrease until August, when there was an increase for about ten days. From the 10th of August to the 20th of September the development of new cases was remarkably uniform, averaging less than one-third that of early July. Late in September there was another sudden and decided increase, lasting for about two weeks.

Study of atmospheric temperature records gives no satisfactory explanation of these fluctuations in the development of the disease. The average temperature for the first ten days of July was 75.1° F.; for the last ten days, 74.4°; and for the last ten days of August, 73.1°. Neither of these periods

was especially marked by excessive daily fluctuations of temperature.

TABLE

Showing the date of onset of diarrhœa after June 20.



Upon tabulating the histories, examination of the column in which was placed the number of passages per day revealed a striking decrease after July 20. Twenty or more passages were very common before that date, but rare after it. This means a change in the prevailing type of the disease. Serous diarrhœa characterized by frequent watery passages was common in July. In August the prevailing type was that of the thicker grumous green stool, of much less frequency.

Thus there were three quite distinct periods. The first, beginning the middle of June, terminating about the middle of July, in which diarrhœa was more prevalent than at any other time, the serous type being common. The second, from the first of August to the middle of September, during which comparatively few new cases developed; the number of cases under treatment, however, being large, for entero-colitis was common, dating back in many instances to a dyspeptic diarrhœa in July. The third, during the latter part of September and first of October, in which the cases were numerous and largely of the dysenteric type.

Much care was exercised in obtaining the facts concerning feeding. Mothers alleging exclusive breast-feeding were questioned with especial care. No case is classed as breast-fed which was accustomed to receive even the smallest quantity of cow's milk or any article from the table. The results were as follows:

Breast alone	10,	died 0
Breast and bottle	19	" 2
Breast and table	16	" 1
Cow's milk (with or without an infant food)	17	" 0
Condensed milk alone	12	" 2
Table alone	38	" 0
Table and bottle	16	" 1
	128	6

Partially nursed, 35 (twenty-seven and one-tenth per cent.); table-fed, wholly or in part, 70 (fifty-four and eight-tenths per cent.); breast-fed (10 children), seven and eight-tenths per cent. of the whole number.

In computing the percentage of the breast-fed, the whole number of patients is not a proper basis, for many of them were past the nursing age. Assuming twelve months as the limit for the nursing age, the percentage becomes fifteen and eight-tenths.

Several of the mothers were themselves ill, one was excessively anæmic, one was pregnant, and two were menstruating. But the actual cause seemed to me to be improper methods of nursing. These children, without an exception, were nursed at irregular intervals. The breast was given at any hour of the day or night at which it was demanded. Neither the nipple nor the mouth were ever cleansed after nursing. Milk was left to decompose and become infected with bacteria to be carried into the stomach at the next feeding.

The highest mortality was among those fed exclusively on condensed milk. One of the chief objections to its general use is the difficulty of determining the proper proportions, and the erroneous ideas of mothers as to its preparation. As seen in the dispensaries, some children are greatly overfed, while others are literally starving to death.

The apparent good results of exclusive table-feeding is

readily explained by the fact that all the older children are included in that class.

The ultimate result is known in 127 cases. Of these, 85 were dyspeptic, of which, 3, or three and a half per cent., died; 42 were cases of entero-colitis or colitis, of which, 3, or seven and one-tenth per cent., died. The death-rate for all cases was four and seven-tenths per cent. Of these six deaths, two occurred in July, one in August, one in September, and two early in October. Two children were decidedly marasmic, one was rachitic to a marked degree. Only one developed thrush prior to death. Ages of the patients who died ranged from one to sixteen months.

A series of 13 cases presenting symptoms commonly known as dysenteric was of considerable interest. I am well aware that pathologically cases of this class present no evidences beyond those of intense entero-colitis or colitis. Clinically every case presented distinctive features. Ten of the thirteen occurred between Thirty-sixth and Forty-first Streets, west of Eighth Avenue; nine of them after September 1. Five were on Forty-first Street, four of them in one house, at No. 442. I heard there were other similar cases in the house.

The onset of distinctive symptoms in each case was definite; in ten of them sudden, the mother being able to name the day and almost the hour. The passages after the first few hours were frequent and small, consisting wholly or in part of mucus, usually in colorless or brownish jelly-like masses, streaked with blood and containing blood in small clots, and after a few drops pus. Straining or tenesmus was always present. Vomiting occurred occasionally, but was not troublesome. Fever was invariably present and was usually high.

The medicinal treatment was the same in each case. It consisted in the administration of castor oil to remove decomposing matter and flush the bowel from above, and sufficient opium to relieve pain and tenesmus and quiet restlessness.

Irrigation of the bowel has always been in my experience eminently satisfactory. It is rational treatment, old and well-known, but is not as generally employed by the profession at large as it should be. Of these cases, ten received rectal injections of some character. Large injections of bismuth were

given to two patients, two drachms of the powder being used. Much difficulty was experienced in holding it in suspension sufficiently perfect for injection through a long tube without clogging. Smaller injections of fifteen grains, suspended in mucilage and peppermint-water, seemed to allay rectal irritability. It is doubtful if bismuth can be of avail without previous irrigation, while, after irrigation, but little additional relief seemed to be afforded.

In six cases the larger intestine was irrigated with a weak solution of borax or common salt. The operation was made as simple as possible. A rubber sheet was spread across the lap of the nurse and gathered into a pail. A large-sized gum catheter, attached to the tube of a fountain syringe, was passed eight to ten inches into the bowel, the water being allowed to flow during its passage, opening up the way. From two to four quarts of the solution were used, the excess flowing out around the catheter. This is therefore an irrigation, not a simple injection. One washing a day thoroughly done is more effectual than an imperfectly-given injection every hour.

These patients all made a rapid recovery, and the good results of the treatment were undoubted. The straining would decrease and sometimes wholly disappear, and the passage in most instances was stopped for several hours.

In two cases small injections were given by the mother, evidently with relief to the patient, though recovery was slow. Excessive tenesmus or partial prolapse of the rectum was usually much relieved by application of a two-grain solution of nitrate of silver.

Of the three patients receiving no injections, one recovered in eleven days and two died. One, however, was in the worst of surroundings and was utterly neglected.

Indiscriminate irrigation is to be condemned. The indications for its employment, which I have followed, are small mucous passages accompanied by straining or tenesmus, or the appearance in the stools of pus, clotted mucus, or blood.

Numerous observations and experiments of recent years have pointed to acids as, theoretically, valuable agents in the treatment of summer diarrhœa. Practically their value has long been acknowledged. I attempted during the summer to de-

termine their efficiency with more certainty, or more correctly the relative value of acids and alkalies. An acid was given to every other case, while the alternating case received an alkali. Castor oil was always administered unless the passages were very large and watery, and the acid or alkali was added to a simple bismuth mixture without opium. Dilute hydrochloric acid was employed in doses of one to two minims for each year of age, and was usually given at intervals of two hours.

TABLE

Showing the ultimate results of treatment by acid and alkali.

	Improved under treatment and recovered.	Unimproved but recovered.	Died.	Total.
Acid ...	38 cases, 88.7 per cent.	4 cases, 9.1 per cent.	1 case, 2.2 per cent.	43 cases
Alkali..	31 cases, 75.7 per cent.	8 cases, 19.5 per cent.	2 cases, 4.8 per cent.	41 cases

Though this is distinctly in favor of the acid, the number of recoveries alone is not a test of the success of treatment. The duration of the disease and the condition of the patient while under treatment is far more reliable. I regret that many of these cases in which the ultimate result was known were not followed sufficiently close to know the actual course of the disease.

TABLES

Showing the comparative results of treatment in fifty-four cases.

Acid.	Recovered.	Improved.	Unimproved.	Died.	Total.
Four days or less..	13	3	2	..	18
Five to eight days	4	2	1	1	8
Ten days and over	2	..	..	..	2
Total	19	5	3	1	28

Alkali.	Recovered.	Improved.	Unimproved.	Died.	Total.
Four days or less..	8	2	3	..	13
Five to eight days	2	3	2	2	9
Ten days and over	2	1	1	..	4
Total	12	6	6	2	26

Of the patients receiving the acid, forty-six and a half per cent. recovered within four days, and fourteen and two-tenths per cent. were improved. Of those receiving the alkali, thirty and seven-tenths per cent. recovered during the same time, and seven and seven-tenths per cent. were improved.

Study of individual histories leaves no doubt of the beneficial effects of acids in almost all forms of diarrhœa. Some cases doing badly on alkalies at once improved when changed to the acid, while the reverse is equally true. I hoped to be able to discover some more definite clinical indications for the use of the two drugs than have yet been given, but the results were rather unsatisfactory. While on the whole acids were more efficacious than alkalies, I was unable to determine with certainty in any individual case which would yield the best results. The good effects of acid were most marked in cases of several days standing, and particularly in the so-called lienteric diarrhœa. The alkalies were most effective in the earliest stages and in cases marked by sour vomiting. In late stages when active diarrhœa has been checked, but digestion is impaired and convalescence is slow, when the passages are not yet normal, and any indiscretion threatens a return of the disease, acids are strongly indicated.

General conclusions are those that have been already formulated by others: alkalies in the earliest stages, acids in the later stages, in conjunction with other remedies.

DISCUSSION.

Dr. Booker.—In my work on the intestinal bacteria of infants affected with summer diarrhœa, I have realized the importance of studying the chemical action of the bacteria, but have been unable to carry this out for want of a proper chemical training.

It is fortunate that so distinguished an investigator as Dr. Vaughan has interested himself in the subject, and we are to be congratulated that he has presented to this society the valuable results of his research.

For some time there has been an impression among those who have given special attention to the intestinal bacteria in children that the injurious effects of the bacteria are more of

the nature of chemical products formed by them than of a direct action of the bacteria upon the intestinal wall.

The investigations of Dr. Vaughan afford a scientific basis for this belief.

In the present state of our knowledge of intestinal bacteria in children, it appears that different forms of injurious chemical action may be produced by different varieties of bacteria in the intestine. One form of chemical action consists in an excessive production of acid, causing an irritation of the intestinal wall; another, in the formation of poisonous products which are absorbed and give rise to toxic symptoms.

It would be premature and unsafe to make positive statements from my study of the bacteria isolated from the diarrhœal fæces; yet a comparison of the bacteria isolated from the different cases with the clinical history of these cases indicates a variation of the bacterial vegetation in the different forms of summer diarrhœa.

In children having diarrhœa without toxic symptoms, those varieties of bacteria were chiefly found which, as far as their chemical action has been studied, cause acid fermentation of milk.

In children having diarrhœa with toxic symptoms other varieties of bacteria appear, and often in great quantity, among which are bacteria which cause putrefaction in albuminous compounds.

It is of special interest that the three varieties of bacteria which Dr. Vaughan selected for study, and from which he obtained the important albuminous products, were found almost exclusively in children having diarrhœa with toxic symptoms.

These three varieties of bacteria are considered the most important of the thirty-five which I have isolated from the diarrhœal fæces.

The two liquefying varieties are described in Volume I. of the Transactions of this society.

The study of the biological and pathogenic properties of these two varieties, with the clinical history of the cases in which they were found, has led me to expect just such results as Dr. Vaughan has obtained.

The third variety, bacillus X, was isolated during the past summer, and has not yet been described. It was found in only one case, but from its enormous quantity in the fæces, together with the condition of the child, it was regarded as an important variety.

The child had been sick one month, was emaciated, rest-

less, and had frequent watery and odorless stools. Death occurred in a few days after the cultures were made from the fæces.

Only two varieties of bacteria were found in this case,—bacterium coli commune and bacillus X, the latter greatly predominating.

We are not sufficiently acquainted with the antiseptic condition of the digestive canal to speak with any degree of certainty on the subject.

As far as may be judged from tests made outside of the body, the acid of the gastric juice is the only secretion of the digestive canal possessing antiseptic properties. In infants, especially those fed on an exclusive milk diet, there are modifying circumstances which may diminish the antiseptic property of this secretion materially, such as the relatively smaller quantity of hydrochloric acid secreted in infants, the absorption of this acid by milk, and the short time that milk remains in the stomach of infants.

I have examined the stomach contents, obtained by expression, of twenty children, subject, however, to the objection of having been made on dispensary patients, in whom it was not practicable to accurately determine the interval after feeding in each case. As the results correspond with those obtained by others, it may not be without interest to state them.

Three of the children were from two to three years of age, and fed on a mixed diet; the others were under twenty months of age, and fed on milk diet. Phloroglucin-vanallin reaction for free hydrochloric acid was manifest only in the stomach contents of the three older children. In these cases very few, if any, colonies of bacteria grew in cultures made from the stomach contents, but fungi, especially oidium lactis, were quite abundant. Free hydrochloric acid reaction was not found in the stomach contents of the children fed on milk diet. In these cases colonies of bacteria were more numerous in cultures from the stomach contents, but even here the paucity of colonies was in striking contrast to the enormous quantity in cultures from the fæces.

It is doubtful if the infant's stomach is protective to the intestine from injurious organism. It is more probable that protection is afforded by the absence in the intestine of suitable conditions for the growth of such organism.

When injurious bacteria find the conditions for their growth in the intestine, the best means we have for their removal consist in a free evacuation of the intestine, temporary withdrawal of food, and change in diet, based on the condition of the child and the nature of the stools.

DR. FRUITNIGHT.—The subject is such a vast one that I will only speak of treatment, and in as brief a way as may be. At the sea-side hospital, conducted by St. John's Guild of New York City, over one thousand very sick children are treated every summer, and it is a standing rule for the house staff to give as little medicine as possible, or none at all in suitable cases. Now, these children are the sickest of the sick, and are selected from the sick sent down the bay four times a week on the floating hospital. It is surprising to see what a change is brought about by the sea-air, correction of diet, bathing, hours of rest, and other approved hygienic measures.

With regard to therapeutics, based on the idea that the disease is of bacterial origin, I gave a pretty thorough trial of naphthol, salol, salicylate of bismuth, resorcin, etc., but never found that they verified the theory. As to salicylate of bismuth, it is a dangerous remedy. It frequently causes ecchymosis in the gastric mucous membrane, and should be used sparingly. The important point in the treatment is the regulation of the diet. I have often ordered a discontinuance of milk entirely for several days, putting the patient perhaps upon some farinaceous food, as barley gruel, reinforced by white of egg mixed in water, cracked ice, with whiskey or brandy or champagne. If this change of diet causes indigestion, milk may be added, but always sterilized. As to beef-tea, in my hands it has been prejudicial because of the laxative action of its salts. One of the most important measures is bathing, particularly with alcohol and water. A sponge-bath several times a day has a derivative effect upon the intestinal tract and a sedative one upon the general system. Before administering drugs the bowel is irrigated high up by means of a catheter, and in some selected cases the stomach is also washed out after Dr. Lister's method. Among drugs, I have used with most satisfaction the mixture of chalk and some mild opiate, combined with quite large doses of subcarbonate or subnitrate of bismuth. If cerebral symptoms threaten, I omit the opium. In cases of a dysenteric nature, I do not irrigate the bowel, and control the tenesmus and bloody discharges with the elixir of coto bark.

DR. HOLT.—I would say a word with reference to classification. It is very difficult to classify these cases satisfactorily. One criticism which I would offer is the general use of the term catarrh. If we mean inflammation of the intestine (and catarrh means this if it means anything), let us call it enteritis, colitis, or gastritis. I think we have an idea that somehow or other there is something intermediate between inflammation

and catarrh. The most important distinction which I have been able to make from a study of these cases microscopically has been to divide them into two classes,—(1) Those in which there are no exudative lesions in the intestine; nothing but a desquamation of the superficial epithelium, and depending, it would seem, as Dr. Vaughan has suggested, upon decomposition due to bacteria. (2) Cases in which there are actual inflammatory changes, those changes being sometimes much more marked than we have any idea of. I began the study of these cases with the belief that there was not much to be found in the intestine. But careful microscopical study of the changes did not support that view. There are in a large number of cases inflammatory lesions of the most serious type; infiltration of the mucosa, which sometimes extends through to the muscular coat. Sometimes even the peritoneal coat is infiltrated.

In treatment it is desirable to differentiate between the cases in which actual lesions are present and those in which we can discount the lesion, and simply say the process is one of decomposition,—a functional disorder. If we can find some guide in differentiating between these two classes of cases, it will be of the greatest advantage. The most important one, I think, is probably the temperature. I have never yet found at autopsy marked lesions but where persistent temperature had been present. I do not mean the initial rise, which lasts usually twenty-four or thirty-six hours. That is found in the vast majority of cases. I mean a persistent temperature, lasting four, five, or six days, and running up to from 101° to 104° F. I believe that invariably at autopsy in such cases lesions will be found. But where the rise in temperature is only transient lesions are almost always absent. It is, therefore, most important to have a record of the temperature in these cases.

It seems to me, then, that there are two classes of cases; those where there is decomposition and functional disorder, or cases of acute mycotic diarrhœa depending on bacteria or their products; and other cases of inflammatory diarrhœa or entero-colitis.

With reference to the bacterial side of the question, it is a very complicated one. Equally important with it in etiology, I think, must rank the local conditions in the intestine, which render the child susceptible. In certain children we can tell long beforehand that they will have diarrhœal trouble in the summer because gastro-intestinal functions have never been normal. A slight amount of functional derangement present so diminishes the local resistance of the tissues that the very

best possible predisposing conditions to acute mycotic diarrhœa are present.

Regarding the use of drugs, I think we give too many. The more cases of summer diarrhœa which I treat the fewer drugs I give. I am certainly free to admit that the treatment of summer diarrhœa by drugs alone or chiefly is a failure. I do not believe it is possible to give any drugs by the mouth which will control in any efficient way decomposition in the intestine, particularly the lower intestine, and that is where we have most trouble,—the colon. I think the condition of the stomach may be to a degree modified by drugs, but where the gastric symptoms are slight, or absent altogether, I think these drugs will fail. The only drug which comes in contact with the lesions directly I think is bismuth. Failure from it comes from too small doses. I give to a child a year old at least two drachms daily, and half an ounce to those older. This drug acts locally, and, as said, is the only one which reaches the seat of the lesion,—the last one or two feet of the ileum and the colon. Drugs may do a great deal of harm. Indeed, I think an immense amount of harm has been done by drugs in summer diarrhœas,—not only by opium, but by vegetable astringents as well. The latter seem to me to be worthless in a vast majority of cases. All of the tannin preparations interfere with the already feeble digestive powers of the stomach, and thus do harm. They act only locally, and in order to have any local effect such a large quantity has to be given as to do more harm in the stomach than they can possibly do good in the intestine.

Then, too, we have a *patient* to treat. We should never loose sight of that fact. In our studies of bacteria, of acid and alkaline stools, etc., we are apt to forget that we have a living baby to consider. The success of every measure in treatment should be estimated by its effect upon the general condition of the child. Here, where little or no food is absorbed, where digestion is often completely arrested, we should give foods which have been quite digested, or stimulants. I have found great benefit the past year from the use of completely peptonized milk. I do not think it is sufficiently used. Put into the milk five grains of the extract of pancreas, fifteen grains of the bicarbonate of soda, let stand two hours, and it will become completely peptonized. It is quite bitter, but nitro-hydrochloric or hydrochloric acid and a little sugar may be added to cover this up; and it makes a palatable food, many, in fact most, infants taking it without any addition. It is not likely to upset the stomach.

Irrigation of the colon I have found on the whole beneficial;

it need not be very frequently repeated. I think nothing is better than a saline solution,—a teaspoonful of salt to a pint of water.

Dr. Blackader.—I do not know that I can add much to what has gone before. The question has always been before me, why is it, as the facts brought out by Dr. Crandall and others show, that the disease under discussion is limited to those under two years? Is it the food that these children live on,—milk? But many of these patients, after the twelfth or thirteenth month, do not live on milk food. So I hardly think the food can be put down as the cause. Is it because the glands are to an extent in a developing stage? I have in a measure excluded that also, although it is possibly a factor in the case. I have been unable to arrive at any complete satisfactory explanation.

I have myself come to the conclusion, as Dr. Holt and others have reached, that drugs for the control of this form of diarrhœa are of very little value. My own feeling has been, first of all, to correct the effect of the lowering of the vital powers caused by the heat. That should always be borne in mind. I think the pain should to a certain extent be lessened, and I invariably give opium by the bowel in sufficient doses only to control or modify slightly the peristaltic action of the bowel and to keep the child free from pain to a certain extent, believing pain is a strong depressor of the nervous system and interferes with digestion. I believe starvation and change of diet is one of the best modes of controlling the growth of the bacteria. My treatment has come down to this: a laxative at the outset, pepsin, opium by the bowel in small quantities. Beyond that I do not see much reason to proceed. At the same time, of course, the vital powers should be kept up. And one of the best means of controlling the bacteria is to enhance the resisting power of the child. If we allow the vital powers to be lowered in any way at all, we favor the absorption of the ptomaines and the growth of the bacteria.

HOW TO PREVENT SCARLET FEVER.

BY J. LEWIS SMITH, M.D.,

New York.

In order to determine how to prevent a disease, the nature and mode of operation of its cause should be ascertained. This is especially true as regards the infectious maladies. The microbe which causes scarlet fever has not been positively ascertained, but the mode in which it is propagated is known to a certain extent by clinical observations. Scarlet fever is contagious from the first day of its occurrence, and if no disinfection be employed, its contagiousness probably does not cease as long as desquamation continues. The discharge from the ear following scarlet fever, due to otitis media, is believed by some to be infectious, even after the desquamative period is over, unless the ear be treated by antiseptic injections. If this be so, the contagiousness of scarlet fever is prolonged beyond that of most other infectious maladies.

The area of contagiousness of this disease is small, extending only a few feet from the patient. Hence in the asylums its spread is more certainly prevented by strict isolation of patients than is measles or pertussis, the specific principles of which are more diffusible in the atmosphere, and their area of contagiousness therefore considerably greater. The fixity or feeble diffusibility of the scarlatinous poison affords explanation of the fact that many children who are exposed, particularly if remotely exposed, do not contract the disease. Dr. Billington has stated that of 90 children, in 26 families, who were exposed to scarlet fever, 43 contracted it, while the remaining 47 escaped; whereas, as is well known, few children unprotected by a previous attack fail to contract pertussis, variola, varicella, or measles if exposed to either of these diseases. In the New York Foundling Asylum, during a series of years, children with scarlet fever were quarantined in a small room attached to one of the wards. The door between this room and the ward was permanently closed, and the nurses of the scarlet-fever patients were strictly isolated. By

these simple precautionary measures an outbreak of scarlet fever in this institution was usually limited to a few cases, whereas the same precautionary measures employed in regard to measles and pertussis were ineffectual in preventing these diseases, which required isolation to a greater distance.

But this advantage in the small area of contagiousness of scarlet fever is more than counterbalanced by the remarkable tenacity with which the scarlatinous poison adheres to persons and objects, and its consequent portability from one locality to another. In its tenacious attachment to objects and its portability, the scarlatinous virus surpasses that of any other eruptive fever except small-pox. I have never met a case in which there was even the suspicion that measles or pertussis was communicated by a third person or by an infected article, but scarlet fever is often communicated in this manner. In one instance that came under my notice, a washerwoman, whose child had scarlet fever, communicated this disease to the infant in the household where she was employed by placing her shawl over the cradle in which it was lying.

In the *New York Medical Record*, August 4, 1888, the case of a servant-girl is related, who nursed a child with scarlet fever in a distant city. She then packed in a trunk her effects, including the dress which she had worn when nursing the patient. The trunk brought from the distant city was opened one year subsequently in the presence of a girl of eight years, who handled the articles. This girl was soon after attacked with scarlet fever, and as she had not been away from home, and as there was no other case in the vicinity, there could be no reasonable doubt that the contents of the trunk, undisturbed for a year, had communicated the disease.

A physician of my acquaintance called upon a family, stated that he had just come from a case of scarlet fever, and took one of the children upon his lap. This child soon came down with a fatal form of the disease, and the two remaining children also contracted it, one of them dying. In New York City, cases which I have observed render it highly probable that scarlet fever is often communicated through school-books and primers, which, illustrated by pictures and rendered attractive to the young, often lie on the bed of the scarlatinous

patient, and are handled by him during his convalescence or even in the disease, if it be mild. The young librarian of the circulating library of a Sunday-school, whose pupils came largely from the tenement houses, spent one day in covering and arranging the books. After about the usual incubative period of scarlet fever he sickened with the disease. His two sisters were immediately removed to an inland town three hundred miles away, and to an isolated house, where scarlet fever had never occurred. About one month after his recovery, the room which he occupied having been disinfected by burning sulphur, the bed-clothes and linen washed in boiling water, and all articles suspected of holding the poison either disinfected or destroyed, the brother visited his sisters in the country. Soon after one of them sickened with scarlet fever, and a little later, the other also. Two months elapsed after the last case, the room occupied in the country-house had been fumigated by burning sulphur from morning until evening, and the family had returned to New York, when a little girl from an inland city remained a few days in the house. She also soon after sickened with scarlet fever, which was fatal. Similar cases might be related, showing that the scarlatinous poison adheres tenaciously to objects for many months, so as to produce the disease in those who are so unfortunate as to be exposed. The judicious regulations enforced by health boards have certainly had an effect in diminishing the prevalence of all contagious diseases, but cases such as I have detailed show the urgent need of additional prophylactic measures as regards scarlet fever, and the same is true of diphtheria.

It is the common practice, after the termination of a contagious disease, to disinfect the apartment vacated by the patient by burning sulphur, with the windows and doors closed. Is this the best that can be done? It is certain that it often fails to produce the desired effect. I have elsewhere stated that in the winter of 1887–88 diphtheria prevailed in the New York Infant Asylum, and that a ward in which five cases had occurred was vacated, its doors, windows, and crevices closed, and sulphur, forty pounds or two pounds to the one hundred cubic feet of air, was burnt in the ward

until it was consumed. After some hours the doors and windows were opened, and Drs. Prudden and Cheeseman immediately raised a dust from the floor and bedding, and allowed it to settle in culture-media. All other sources of infection were excluded from the media. The cultures produced so large a number of microbes that they overlay each other, but the observers were able to distinguish the streptococcus pyogenes in the media identical in form and appearance with the streptococcus which they had previously discovered in an umbilical phlegmon, which one of the diphtheritic infants had in addition to the faucial diphtheria. Although more sulphur was employed than is recommended by the New York Health Board, it was inadequate to destroy the microbes.

Dr. Squibb, who is justly regarded as a high authority in matters pertaining to domiciliary disinfection, and to whom the above facts were communicated, replied that, in his opinion, the lack of success from the employment of the sulphur vapor as a disinfectant is due in part to the fact that it is used in too dry a state. If the sulphur be burnt over a wet sand-bath, or in a room with boiling water, he believes that its germicidal power is greatly increased. Professor Prudden, witnessing the feeble germicidal action of burning sulphur, likens it to the burning of incense before the image of an offended deity, and says that it is scarcely more efficacious. Perhaps chlorine is a more efficient germicide, evolved by adding sulphuric acid to a mixture of salt and black oxide of manganese, as employed by Professor Doremus in the Bellevue Hospital wards.

But attempts to prevent the spread of scarlet fever as well as of diphtheria by disinfection of the vacated room, after the termination of the case, can only be partially successful, if efficient preventive measures be not also employed during the continuance of the case, so as to prevent the formation of the poison or destroy it as soon as it is formed. According to my observations, efficient prophylaxis requires the constant employment of disinfectants in the sick-room, or upon the patient, from the beginning of the disease, or from the first visit of the physician.

Twenty-one years ago, Dr. William Budd, of Bristol, England, wrote of scarlet fever: "Time after time I have treated

this fever in houses crowded from attic to basement, with children and others, who have nevertheless escaped infection. The two elements in the method are separation on the one hand, and disinfection on the other." I am not aware that Dr. Budd stated in detail his method of isolation and disinfection. The New York Health Board very properly gives directions that all objects not required to promote the comfort of the patients shall be removed from the sick-room; its floor and walls should be bare, and no one be allowed to enter it except the physician, nurse, and near relations. For reasons already stated, books, primers, and other reading matter should not be allowed in the hands, upon the bed, or in the room occupied by a scarlatinous patient, unless positive directions be given that they be subsequently burnt.

The attempt to prevent the spread of scarlet fever, and the other infectious diseases, by administering internally antiseptics and disinfectants to those who are exposed has, I believe, thus far met with little encouragement. It is a question whether the efficient antiseptics employed internally can, on account of their toxic properties, be safely used in doses sufficiently large to counteract the specific principle of scarlet fever, when it has obtained lodgement in the system, so as to prevent the disease. Certainly, in the present state of our knowledge, the most efficient and reliable prophylactic measures consist in strict isolation of the patient, the disinfection of his person, disinfection of the air which surrounds him, and of objects and persons that are in close relation with him. It is quite possible, I think, by the employment of such measures, to realize the experience of Dr. Budd. I recommend for disinfection of the room at my first visit, to be used almost continuously during the progress of the case, the following prescription:

℞ Acidi carbolici,
Ol. eucalypti, āā ℥i;
Spts. terebinth., ℥vi. Misce.

Two tablespoonfuls are added to one quart of water in a tin wash-basin or similar vessel with broad surface, and maintained in a state of constant simmering over a gas- or oil-stove. The

odor of this vapor is agreeable rather than unpleasant, and it appears to disinfect, to a considerable extent, the breath and exhalations from the body of the patient. At the same time inunction is prescribed of the entire surface every three hours with the following:

℞ Acidi carbolici,
Ol. eucalypti, āā ʒi;
Ol. olivæ, ℥vii. Misce.

Pharyngitis, varying in severity according to the type of scarlet fever, is present in all cases. In not a few instances, in New York City, where diphtheria prevails, either a diphtheritic exudate occurs upon the faucial surface, or the intensity of the scarlatinal inflammation produces a superficial necrosis, forming an eschar, which is with difficulty distinguished from a diphtheritic patch. The breath exhaled over this surface is offensive, highly infectious, if no disinfectant be used, and is no doubt the vehicle in numberless instances by which the disease is communicated. Therefore, the frequent application to the faucial surface of an antiseptic lotion or spray is strongly indicated. Not only for its beneficial effect on the patient, but as a means of diminishing the contagiousness of the disease.

Perhaps no better disinfectant can be employed than corrosive sublimate, two grains to the pint of water, applied every second hour. One drachm contains one-sixty-fourth of a grain. It may be used as a gargle, or as a spray from a hard rubber atomizer. The sponge is too rough and irritating for the application of this or any other solution to the inflamed fauces. A large camel's-hair pencil, or surgeon's lint or absorbent cotton wound around a slender stick, may be used in the same manner in which Oatman and others employ it in the treatment of diphtheria, the application being made not only over the tonsils, but over the surface of the pharynx, behind and below the tonsils. Of course it is the anginose form of scarlet fever that more particularly requires this mode of treatment, and solutions of corrosive sublimate should be used cautiously, so that a toxic amount of it does not enter the system. In mild

scarlatinous pharyngitis, attended by no pseudo-membranous exudate, necrosis, ulceration, or foul breath, local treatment of the fauces may not be required.

The corrosive sublimate solution, two grains to the pint, may also be advantageously employed for the Schneiderian surface, if it be red, swollen, and attended by a discharge. It may be applied to the nostrils by a small syringe, an atomizer, or, in infants, by a medicine dropper. For a child of three to five years half a teaspoonful may be employed for each nostril, care being taken that, between the nasal and faucial applications, not more than one-sixtieth of a grain of corrosive sublimate be used every two hours.

Antiseptic measures thus employed, certainly greatly diminish the contagiousness of scarlet fever, but it is so very contagious that additional precaution should be taken. Constant ventilation of the sick-room should be maintained, whatever the weather, during the active period of the fever. This can be accomplished by a window partly open, a draft upon the patient being prevented by a screen, the temperature in the room being maintained at seventy degrees, if necessary, by a fire. No letter or written message or article of apparel or furniture should be sent from the room to any family during the continuance of the fever, nor afterwards until proper disinfection be employed, and sufficient time have elapsed.

The cautious physician in attending scarlet fever will always bear in mind the possibility that his person or clothing may become infected, and be the vehicle by which the poison may be communicated to others. In examining the fauces of a patient he should stand a little to one side, so that no mucopus, if the patient cough, be received upon his clothing, and he will not go directly from a scarlatinous patient to a child with another sickness, or to a midwifery case, without first washing his hands, hair, and face in an antiseptic solution, and changing his outer apparel, or if he be hastily summoned to a case, without the opportunity of proper personal disinfection, he will approach no nearer the patient than is sufficient for a clear diagnosis.

Do Health Boards accomplish all that they are able to do in suppressing scarlet fever as well as diphtheria, the preven-

tion of which has been so well discussed before this society by Dr. Caillé? The exclusion from the schools of children living in the houses where either of these diseases is occurring, the directions given for the disinfection of the bedding, clothes, and articles employed in the sick-room, and the promise to disinfect the sick-room when word is sent to the Board show a praiseworthy endeavor to eradicate diphtheria and scarlet fever, as small-pox has been eradicated. But these measures are only partially successful. To my knowledge many families in tenement houses never send word that they are ready for disinfection, and many move away as soon as the sickness is terminated, in the belief that they can find more salubrious apartments elsewhere. The vacated rooms are re-rented as soon as possible to families, who have no knowledge of the previous sickness, and are surprised when their children immediately afterwards are taken sick. Although the measures employed by Health Boards for domiciliary disinfection may be inadequate, it is the duty of attending physicians to see that they are carried out, such as they are, and to direct the employment of such other remedies as may seem necessary, in order to prevent propagation of the disease. The rubbing of the walls of the infected apartment with slices of fresh bread, which gather up microbes, as recommended by Professor Prudden, and especially whitewashing or calcimining or washing of the ceiling, walls, and floor with a solution of corrosive sublimate, should be insisted on before the apartment is again occupied.

HOW TO PREVENT DIPHTHERIA.

BY AUGUSTUS CAILLÉ, M.D.,

New York.

THE extension of our knowledge concerning the bacterial origin of many forms of disease is the greatest achievement in the medical progress of this century, and marks an epoch in scientific progress generally.

Thought and inquiry are forced into new directions, and

preventive medicine is raised from its speculative depths and claims consideration on a scientific basis.

Signal success has attended our efforts in preventing wound infection, but the prophylaxis of strictly non-surgical disease has up to the present time not reached a satisfactory state of development. The reason is obvious: the infection of some external visible and accessible lesion may be prevented with ordinary care and by comparatively simple and safe means; on the other hand, we must at the outset recognize the difficulty of attempting to prevent the absorption of septic matter through the mucous lining of the respiratory and digestive tract. That this difficulty will in many instances be overcome I do not doubt; for the more we become familiar with the laws governing, and the conditions necessary for, infection, the stronger will become our desires for preventive measures.

Puerperal sepsis, which was a mystery up to the time of Semmelweiss, now yields to preventive management. Diphtheria, in many respects analogous to puerperal sepsis, is next in order to forfeit the dignity of its former position among the diseases of obscure origin and pernicious effect.

I cannot here speak in detail of the dangers of diphtheritic sepsis, its general prevalence and endemic position in all large cities. In the present state of our knowledge we look upon diphtheria as of bacterial origin, whose propagation is favored by moisture and the absence of sunlight. Diphtheria exerts its pernicious influence principally on the individual living in poor hygienic surroundings, or upon those who are already afflicted with chronic or acute catarrhal lesions of the upper respiratory tract (the usual site of its access), upon which the poison of diphtheria finds a favorable nidus for development and propagation.

Although diphtheria is probably of exotic origin, it is at the present time quite beyond the control of the central government, and the study of its prevention must be viewed with reference to municipal control. As my personal experience is limited, as far as diphtheria is concerned, to the city of New York, my review and suggestions of preventive measures shall be made with reference to the habits and conditions of the people of New York City.

Towards the prevention of infectious diseases in general, and diphtheria in particular, certain systematic methods are directed, which may be classified as follows:

1. Measures tending to dilute or destroy the existing poison.

2. Measures tending to prevent the infection of the individual. Thus the following features present themselves for brief consideration:

1. The schools, public, parochial, and private.
2. Homes and dwelling-places of the people.
3. Disinfection and disinfecting stations.
4. Isolating hospitals and temporary homes for poor children.
5. Street-cleaning.
6. Personal prophylaxis.

The schools, public, parochial, and private, are the great centres for diphtheritic infection, and none but the most radical measures will succeed in bringing about a change for the better.

For each school one or more sanitary inspectors should be appointed,* whose duty it would be to see that the rooms are not overheated, and to make a rapid but efficient inspection of the children's throats as they enter or leave school. No tongue-depressor should be used, and the children should be taught to use their own fingers as a tongue-depressor. Each child who is found to be afflicted with an inflamed throat, nasal catarrh, cutaneous eruption, ophthalmo-blennorrhœa, or any other plain evidence of disease, should at once be sent home with a printed card announcing, "Your child is sick; take it to a physician or dispensary."

During the year 1888 the number of children taught at public schools was three hundred thousand; the average total attendance, one hundred and fifty-seven thousand; this includes the public day schools and evening schools, nautical schools, and all the corporate schools, such as industrial, re-

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* As previously suggested by Dr. Herman Ludwig Cohn, in his brochure "Uber die Noth Wendigkeit der Einführung von Schularzten." Breslau, 1886.

formatory, and orphan asylums (Forty-seventh Annual Report of Board of Education).

One physician or inspector is able to inspect from five hundred to six hundred children in an hour (say 8 to 9 A.M.), and in all probability the daily services of three hundred physicians for one hour would suffice for the necessary inspection. For such services the city should pay each physician three hundred dollars (yearly), making a total of about one hundred thousand dollars,—a paltry sum for our community to pay if we take into consideration the direct benefit accruing therefrom. All private schools should secure the services of a physician for daily inspection, and for such services rendered an addition of five dollars to the quarterly tuition fee will meet with no objection on the part of the parents of children attending those institutions. It is a well-known fact and common experience that older children are apt to conceal the first symptoms of illness for fear of being obliged to remain home from school and thereby falling short in their studies and losing ground in their class; moreover, this pathological excrescence of our high-pressure educational system would be effectually checked by a rigid inspection, and I sincerely hope that an endorsement of the foregoing suggestion will go forth from this Society and fall upon fruitful soil.

Street-cleaning.—Manhattan Island is so located that thorough drainage and clean streets can be secured. At the present time, however, with incomplete subways and transit facilities, and the city pavement in perpetual motion, no system of cleaning will avail.

Our present system is so elementary and unsatisfactory that a study of the best methods of other countries is opportune; at any rate, we should insist upon having the street-cleaning and removal of ashes done entirely at night and in such a manner as to avoid dust; for it is the atmospheric dust which irritates the upper air-passages; such a condition occasions congestion, and consequently predisposes to diphtheritic inflammation.

The tenement houses.—The past ten years have wrought a great change in the appearance and appointments of the tenements in our city. The average city lot is twenty-five by one

hundred, and the older double tenements occupied from forty to fifty feet of the lot. Each side of the house contained four rooms. The water and sink were located in the hall-way on each floor; the privy vaults were in the yard, which was large and spacious unless partly occupied by a small two- or three-story rear house. In the "old-style" houses the hall-ways were quite dark, and unless the sinks were well trapped a noxious odor from the sewers was prevalent; but the apartments, on the other hand, had no connection with the sewer, and, as the houses were not deep, each family occupying half a floor through had plenty of light and ventilation.

Since 1880 vast improvements have been made. Houses eighty-five feet deep, with seven rooms on the half-floor, are now built upon the same sized lot. Each floor has two hopper closets, and each apartment two stationary tubs for washing, and in some cases a stationary ice-box,—all connecting ultimately with the sewer. The front and rear rooms certainly are light and airy; the five interior rooms all connect with a narrow air-shaft or court-yard, which is supposed to admit sunlight and fresh air. Now, the fact is that many of the interior rooms are so dark that an artificial light for any kind of work is necessary. The court-yard is open above, flagged below. It has a drain into the sewer and is trapped. Whenever we have a dry period the stagnant water in the trap becomes foul and furnishes foul air for all the bedrooms.

The water supply for the three upper floors is secured by means of a tank on the roof, into which the water is pumped once or twice a day. These tanks contain considerable organic matter, and it appears to me that during the hot months, when the water in the tanks becomes heated by the sun's rays, such a preponderance of organic matter must become a source of danger. Notwithstanding the progress in sanitary plumbing, I know it to be a fact that our improved flats and tenements always contain sewer gas. This complex gas will not in itself create specific disease, but it will certainly produce that condition of malaise which we are so often called upon to treat, and which predisposes to all forms of infectious disease, notably diphtheria.

It may be interesting in this connection to refer to the experimental introduction of some forms of water-closets in our city. The old-style privy vaults were the same as are used in most European cities, and were a perpetual source of bad smells, because there was no way of keeping them tightly closed. Some years ago the "school sinks" were introduced by order of the Board of Health, and soon got into public favor as a great improvement on the privy vault. After a large number of houses had been provided with such closets, their introduction was abandoned in favor of hopper closets, and at the present time all tenements are provided with such closets, usually two on each floor.

The abandoning of the popular school sinks was a surprise to property owners, but finds its explanation to a certain extent in the following circumstances, as reported by Dr. Cyrus Edson in his communication, "The Poison of Typhoid Fever" (*Medical Record*, January 5, 1889):

"Twelve cases of typhoid fever were due to the following method of infection, which was discovered by investigation. Six cases of typhoid fever occurred in a tenement house in West Thirty-second Street.

"The first case in the house occurred on August 15, and was in the person of an employé of the Department of Public Works, whose duty it was to clean and repair the public sewers. The other cases appeared in from twenty to sixty days after the first. The plumbing of the house was carefully examined and no defects were found. I visited the premises and found that the school-sink privy in the yard was flushed by means of a branch from the Croton supply-pipe, introduced in such a manner that its mouth was just under the surface of the contents of the sink when the latter was full. On account of the insufficient water supply a force-pump was provided in the hall of each floor of the house above the first story. No fixtures were placed in the living rooms, the occupants of the different floors being compelled to obtain the water they used from the pumps in the halls. The supply to the school sink was provided with the usual valve to cut off the water, but this valve was always turned on so as to allow a stream of water to constantly flush the sink. When two

pumps were being operated at once the suction induced was sufficient not alone to draw from the Croton main, but also to suck a portion of the privy contents into the water-pipes, thus contaminating the water. The amount drawn in was not enough to attract the attention of the tenants by the taste imparted to the water. The other six cases attributable to this cause were in a house in West Thirty-seventh Street, and the conditions found were the same as those I have just described."

As an instance of one of the sources of disease propagation the above illustration deserves to be generally known. The high valuation of real estate on the one hand, and the demand for healthy and comfortable apartments for the working-class on the other hand, puts us face to face with a problem difficult of solution; still I cannot but state my firm conviction that the improved twenty-family tenement house is a serious mistake, and that the future tenements should be of simple construction, with an annex for all waste-pipes and such conveniences and modern improvements which are known to be a source of danger to the tenants.

Disinfection and isolation.—Through the courtesy of Dr. Cyrus Edson, I am able to report upon the means employed by the Health Department of New York City, for the prevention of contagious disease, and for the treatment of such cases as come under its charge in this city. These regulations are given in the abstract, and will probably be of interest, as they have never been published.

1. Certain sections of the Sanitary Code require physicians to report contagious disease.

2. The city is divided into ten districts, under the supervision of ten medical inspectors.

3. On the report of a case the inspector visits the premises, and if they are occupied by three families or more, each family is notified of the existence of contagious disease thereat.

He endeavors to trace the disease to its origin, provides disinfectants, and reports the case at school. He investigates the premises as to sanitary defects, and his recommendation secures an order for repairs.

After the termination of a case, if it has occurred in a pri-

vate family, the inspector calls on the attending physician and offers the aid of the department as to disinfection, etc. If the case is to go to a hospital it is first seen by a special inspector, who has special experience in diagnosis, in order to protect the city from an action brought by persons removed to hospitals by reason of a faulty diagnosis. If contagious disease exists in the living-rooms of a family having a cigar, grocery, dry-goods, or clothing store in front, the place of business is closed by the department, the patient invariably taken to the hospital, and the premises fumigated, after which business is resumed.

The department's means of conveyance are coupés and ambulances.

It is the intention of the department at an early date to remove portable articles to a disinfecting station and disinfect by hot air and steam.

The Willard Parker Hospital accommodates seventy to eighty patients, the wards for scarlatina and diphtheria being entirely disconnected from each other, also the attendants. Mothers are frequently allowed to accompany children, providing they will comply with the rules and regulations, and remain in the hospital until the case terminates. Friends of patients can visit the hospital once a week, and remain one-half hour. It has not yet come to the knowledge of the department that any person who has visited the patients of this hospital has propagated contagious disease by such act.

With a view to the better education of nurses in the treatment of contagious disease, certain training schools have an arrangement with the Willard Parker Hospital whereby the Health Department affords opportunity for the pupils of the training-school to have special instruction in the treatment of contagious disease.

The Health Department has appointed three pathologists, whose position is purely an honorary one.

In my opinion the above rules are in every way admirable, and ought to be effective if carried out. In some instances the alterations ordered by the inspectors and the board appear to be unjust, and the interests of the house owner are made

to suffer without an adequate gain to the tenants and the community.

The Willard Parker Hospital has proved all that was hoped for, and it is to be hoped that a dozen such institutions will be erected and be provided with a bureau of inquiry, presided over by a gentlemanly official, to answer during certain hours the questions of anxious parents.

The erection of temporary homes, open-air play-rooms on house-tops, and water-fronts for the poor, is only a question of time, and would certainly contribute to the welfare of the people.

The courtesy of the Health Department towards the attending physician is much appreciated by the medical profession; on the other hand, many practitioners do not appear to realize that a physician should be a sanitarian as well, and not limit his management of a case to the prescribing of drugs. It is the duty of the attending physician to secure, if possible, proper isolation of a person sick with diphtheria, and such a person should be placed in a room having the best light and ventilation. This room should be bare of everything except what is necessary in the management of a case. Persons in attendance upon a case of diphtheria should wear a long loose wrapper with sleeves drawn tightly at the wrists. For the cleansing of hands I prefer sapolio and Labarraque's solution. Contaminated articles of little value should be burnt. The bodies of the dead should be tightly wrapped up in some cheap material saturated with a strong bichloride of mercury solution, not to be exposed before burial or cremation, and no public funeral should be permitted.

The disinfection of dwellings and apartments is done by means of sulphur dioxide. It has been claimed upon good authority that such a procedure is wholly ineffective, but as better means have not been suggested the old method will probably prevail. Recent trials appear to prove that sulphur dioxide is decidedly more effective in the presence of moisture, and this fact is always to be remembered when sulphur dioxide is used as a disinfectant.

The disinfection of schools, theatres, churches, conveyances, railroad coaches, etc., is also a matter of serious importance.

Personal prophylaxis.—It is now generally recognized that the municipal control of diphtheria is inadequate, and that methods of personal prophylaxis in diphtheria and other forms of infectious disease are of the greatest value and importance.

One of the paragraphs in the Health Board's instructions for disinfection reads as follows: "Persons in contact with patients sick with diphtheria should use disinfectant gargles under the direction of a physician." I have been informed that this paragraph was suggested by my first communication on a "Method of Prophylaxis in Diphtheria," published in the *Medical Record*, February 18, 1888. For the details of my experiments concerning the value of a daily toilet of the nasopharynx by means of mild antiseptic lotions I must refer to the communication quoted above. In a second communication on the same subject, made to the American Pediatric Society, September, 1889, I took occasion to reiterate my former statement at the hand of a large experience, partly my own and partly the experience of others who had given the method a trial.

Dr. Irvan H. Hance reported, at a recent meeting of the Pediatric Section of the New York Academy of Medicine, that he had carried out my suggestions as to personal prophylaxis at the Nursery and Child's Hospital, New York, during his term of service, and that he is satisfied that good results have been obtained thereby. He says, "When I took charge of the cases in the Nursery and Child's Hospital there was an epidemic of diphtheria in the house, which had started in October, six to eight weeks previous. During that time and up to the first of December there had been eighteen deaths. Special attention was given to the cleanliness of the children's mouths, the older ones having teeth and gums washed with solutions of boracic acid (saturated), and the throats of all in the exposed wards were sprayed with solutions of chlorate of potassium or boracic acid.

"During the subsequent thirty-five months of my service there was *no other epidemic of this disease*, yet the disease was met with from time to time, there being eight deaths during this period at rather long intervals.

	Causes of Death.
December 23, 1885	Diphtheria.
January 7, 1886	Diphtheria (adult).
January 15, 1886	Diphtheria.
May 8, 1886	Diphtheritic croup.
June 25, 1886	Diphtheritic croup.
October 26, 1886	Scarlet fever and diphtheria.
February 17, 1887	Measles, broncho-pneumonia, diphtheria, tuberculosis.
February 19, 1887	Measles, broncho-pneumonia, diphtheria.

"During all this time there were always as many as two hundred children daily in the house, and oftentimes many more.

"This great immunity was undoubtedly due to the care and attention given to the children's throats, which were looked at and examined and sprayed twice a day, and in the infected wards oftener. Apart from the local effect derived from such spraying and swabbing as a prophylactic, the treatment is to be highly recommended and urged upon the laity, as inflamed throats are detected during the incipiency of the disease, and general treatment is begun earlier and with manifestly better results."

At the present time my conviction is firm that, in the absence of filthy carious teeth and nasal obstruction from adenoid vegetations or greatly-enlarged tonsils, the daily prolonged use of mild antiseptic liquids, by means of spray, insufflation, or gargling, will prevent diphtheritic infection.

And I claim that this procedure is indicated for those who are exposed to diphtheritic infection, and also as routine treatment for every case of *nasal catarrh, pertussis, measles,* and *scarlet fever;* in fact, for every condition in children in whom the naso-pharyngeal mucous membrane is hyperæmic or congested, and therefore predisposed to diphtheritic infection.

And I wish to emphasize, in conclusion, that diphtheria, although its contagiousness is well established, is not so readily transmissible as scarlet fever and other infectious diseases; and for this reason, if for no other, the possibility of its occurrence and prevention should stimulate the prophylactic energy of the practitioner in medicine.

RÉSUMÉ.

1. In the present state of our knowledge, the possibility of preventing diphtheritic sepsis cannot be denied.

2. As one of the means of securing this end the daily inspection of school-children is necessary.

3. The municipal control of diphtheria in large cities is inadequate, and methods of personal prophylaxis are more apt to prevent infection.

4. A daily prolonged toilet of the naso-pharynx by means of weak antiseptic solutions is a trustworthy method of prevention in the absence of filthy carious teeth and enlarged and inflamed tonsils.

5. The naso-pharyngeal toilet is indicated for all those who are exposed to diphtheritic infection, and also as routine treatment in every case of chronic naso-pharyngeal catarrh, pertussis, scarlatina, and measles.

6. It is, in my opinion, the duty of the authorities and the medical practitioners to act in accordance with the above views.

DISCUSSION.

DR. EARLE.—These two papers are very, *very* important. We could spend half a day very profitably in discussing them, and then go home and do a little missionary work in our respective cities. It is very well to talk about health boards doing what you suggest. They do not do a hundredth part in my city. Why, there are some men in our own profession who do not believe in the contagiousness of diphtheria, in the first place. We need to do a little missionary work among them. We want to get the medical profession right in the first place, and then we can talk to the people. It was my pleasure a few months ago to read a paper before the Chicago Medical Society, on the contagiousness of diphtheria, and then I was going to introduce a resolution with regard to placarding houses, but as the situation seemed doubtful, I thought it expedient to have my resolution laid on the table until two weeks from that time. Then I read a paper on municipal control of contagious diseases, and had fortified myself, got in some of my friends, and after reading my paper introduced my resolution, and it went through. Since then we have placarded a few houses where diphtheritic patients have been confined, but really only a very small percentage of all. That

the Health Department does not in any considerable degree disinfect these houses is strictly true. I really think the Health Department does not care particularly about being informed. It is expected that they will go around and disinfect houses, but I think we shall have to force them to do it. The first of May I had in our town a case of diphtheria. The people were going to move, and I asked them whether the parties who were coming into the house knew anything about the nature of the disease. They said they did, but I took the pains to invite the Health Department to notify the people who were to come in what had been there, and I presume sufficient care was taken so that the poison was destroyed. But we have to agitate this matter a great deal before we can accomplish what should be done. And it appears to me that if we promulgate the papers read before this Society to-day we can do a great amount of good.

THE USE OF ALCOHOL IN THE TREATMENT OF THE DISEASES OF CHILDREN.

BY A. SEIBERT M.D.,

New York.

It can have no bearing on this discussion to know that persons exist who believe that alcohol ought not to be used as a medicinal remedy any more than as a beverage. We are not here to discuss religion or belief, but science and facts. Alcohol is a drug and a very valuable one. So is opium. We would never think of not using opium because so many acquire the opium or morphia habit.

We are not able as yet to exactly determine the full action of alcohol in disease in every direction, any more than that of many other drugs, and necessarily our views will be modified by the extension of our knowledge, and therefore we may exchange our experience, on an occasion of this kind, with great profit to ourselves and our patients.

The chief action of alcohol on the human body, if given in moderate doses, is a stimulating one, and, as Binz (in Gerhardt's Cyclopædia of Diseases of Children) has it, favorably influences the nervous system, the circulation, and the digestion.

This statement may serve as a basis for the few remarks I have to make.

1. The *nervous system* is no doubt acted upon by alcohol, as it excites the nerve-centres over and above their normal action, and causes a degree of anæsthesia to the action of most pathogenic germs in the body, that we are fully justified in attempting to *counteract* the *nerve-depressing influence* of many germs of disease, as in typhoid fever, scarlatina, intermittent, and some forms of pneumonia.

2. *The organs of circulation* respond very markedly to the administration of alcohol. The heart itself is able to do more and better work under its limited influence in disease than without it. We therefore are inclined to give alcohol in such diseases of children in which we know that the heart-muscle will be strained to an unusual degree,—diphtheria, scarlatina, fibrinous pneumonia.

3. *The digestive organs* are said to be also favorably influenced by alcohol. Undoubtedly they are excited to increased action, like other functions of the body, but digestion itself is *not promoted* by alcohol; on the contrary, it is interfered with directly in the stomach, and retarded by its general action throughout the alimentary canal. In a series of experiments made some five years ago in the Physiological Institute in Munich, and published in the *Archives für Hygiene*, Dr. Limanowski proved that meat could be best acted upon by the gastric juice when alcohol was not present. Regarding beer *per se*, he found that three different blocks of meat, of the same fibre and size, placed in the same quantity of stomach-juice were macerated evenly, provided nothing interfered with them, but on adding a small quantity of clear fresh beer to one block and the same quantity of slightly opaque stale beer to the other, he found that the piece without beer was macerated quickest, the piece in the fresh beer coming in considerably later, and the one in the fermenting beer remaining far behind in the race.

But not alone does alcohol interfere with the action of the gastric juice, but it also caused a catarrhal condition of the mucous membrane of the stomach by irritating its surface, resulting in an insufficient supply of digestive fluid and an abnormal secretion of mucus, thus seriously interfering with

the assimilation of food. Other experimenters have since corroborated the results of Limanowski. The glass of wine at dinner excites the secretory glands of the stomach to abnormal action, but in the end retards the maceration of food.

Keeping these facts in mind, we may now proceed to answer the following questions:

1. When shall we give alcohol in the diseases of children? We ought to use alcohol whenever danger threatens from insufficiency of the heart, muscles, and depression of the nerve-centres, especially in acute infectious diseases, in which the blood and other tissues are invaded by pathogenic organisms. Whether or not alcohol may, to an extent at least, have germicidal properties in the circulation we are as yet not prepared to say, though to judge by recent developments in bacteriological research, the quantity of alcohol brought into the circulation is necessarily too small to really cause an antiseptic action.

We ought never to use alcohol in affections of the stomach, and never whenever it is still possible to nourish the patient. Alcohol is a substitute for nourishment, but not its promoter. In acute cases (diphtheria, scarlatina, and typhoid) I never put alcohol in the stomach of a child as long as digestion is possible, only resorting to it when other food is not taken. In chronic cases I never use alcohol in any form, tuberculosis excepted. The body is built up and maintained by food, and it is our duty in all cases to carefully guard those organs and their functions that carry food to the tissues. If these parts are in a pathological condition, we must interfere with their functions less than ever, and so we can exclude all forms of gastro-intestinal disturbances in infants from the list of diseases where alcohol is beneficial. In acute cases of this kind (cholera infantum) large quantities of water, and smaller quantities of black tea or coffee, will disinfect and stimulate more efficiently than any quantity or quality of alcohol, besides not irritating the mucous membrane, already in a diseased condition. In subacute and chronic gastro-intestinal disorders, the proper management of the proper diet can alone be of benefit, and all drugs, alcohol included, are at least of very doubtful value. To give anæmic children wine because they

look pale is an unscientific and superficial therapeutic order that will in most cases be not only found unnecessary, but harmful. Here too the first rule ought to be to bring back the digestive power of the stomach, and then to add wine to the food, when the stomach is able to overcome its irritating influence with less harm.

2. *How* shall we administer alcohol? As to the form, I will briefly admit that, in acute infectious disease, I prefer rye whiskey to anything else. The children may be bathed with it, or it is given in some gruel by an enema into the bowel. Now and then it may be found necessary to use wine. The sweet Hungarian Tokay wines are certainly very palatable, but interfere still more with stomach digestion than whiskey, on account of the large quantity of sugar or glucose they contain. For years I have been able to do the most of my stimulating by the injection of alcohol (sometimes in combination with camphor) into the large bowel.

As to the time of giving alcohol, it appears best to begin *early* in infectious troubles, gradually increasing the dose, and where the blood seems to be the chief region for the action of the disease-germs, and we are not alone justified, but, in fact, ought to give large and frequent quantities of alcohol.

As to the exact quantity to be given, we can only emphasize that we ought to be guided only by the severity of each case and the size and bodily condition of the child, not so much its age. As a rule, most practitioners omit to give exact instructions as to the quantity of alcohol to be used in twenty-four hours, and, generally speaking, too little of it is used when needed. The maximum dose I use is at the rate of a pint of the best rye whiskey or cognac to every one hundred pounds in twenty-four hours.

So, on summing up, we may say, generally speaking, alcohol should only be used as a stimulant in acute infectious diseases of children, and then in large quantities, and, if possible, should never enter the body through the stomach.

THE USE OF ALCOHOL IN THE TREATMENT OF THE DISEASES OF CHILDREN.

BY JOSEPH E. WINTERS, M.D.,

New York.

I HAVE not found that I know enough about this subject to write about it. Since leaving this hall, at six o'clock this evening, I have been thinking over what rules have guided me in the use of stimulants in diseases of children, and the first conclusion which I came to was that, as to the time when stimulants are to be given or the quantity in which they are to be employed, no definite rule can be laid down. We must individualize, each case must be treated for itself. That is about the most important rule which guides me. I find that in practice I make a very great distinction according to whether the alcohol is intended to affect the heart and circulation or whether it is intended to act indirectly as a tonic. In the first place, it is used as a heart-stimulant to tide over an emergency, especially in pulmonary diseases. In the second, we wish to stimulate the secretions, promote digestion and assimilation, and aid other drugs in these directions. Stimulants are used for this purpose during convalescence from acute diseases. In pulmonary affections I find that I use a great deal of alcohol in combination with extract of malt and cod-liver oil. By the use of two parts of malt extract and cod-liver oil, and one part of whiskey, given in drachm doses every two hours, I find a valuable tonic effect during convalescence from acute disease in children, especially bronchitis and broncho-pneumonia.

With reference to the use of alcohol in acute pulmonary affections, it depends upon whether we are treating a lobar pneumonia or a broncho-pneumonia. It seems to me alcohol is scarcely ever called for in acute lobar pneumonia of childhood as a heart-stimulant. It may be used as a tonic, combined with cod-liver oil and malt extract, when there has been delayed resolution and convalescence.

In broncho-pneumonia I do not use it, as a rule, until the

inflammatory stage has pretty well passed, excepting in cases of progressive broncho-pneumonia, which spreads somewhat slowly through all parts of the lungs. But in pulmonary affections, in which the superficial veins become full, accompanied by cyanosis, of course all use alcohol early and constantly. Whenever, in the course of a broncho-pneumonia, the symptoms appear to be improving, the cough loosened and much less distressing, but on examination we find the physical signs in the chest persisting or increasing, alcohol is indicated, and in full doses. Again, in broncho-pneumonia, and in all pulmonary affections in which the abdomen becomes distended and there is great flatulence, which is as dangerous a symptom as any of heart-failure, stimulants are of very great value.

In any case of acute disease, where there is very great restlessness, and sedatives fail to soothe and quiet, alcohol as a rule will have that effect. But in this use of alcohol we are treating the temperament of the patient, not the disease. But where there is restlessness and tendency to local spasm, with injection of the conjunctival vessels, alcohol is contraindicated. It is also harmful in delirium, with injection of the conjunctival vessels and congestion of the surface.

When, during the use of alcohol in the course of an acute disease, vomiting has come on, I have often found the latter cease only after discontinuing the alcohol. In giving stimulants to children, I have found that, while champagne usually agrees well with adults, it scarcely ever agrees with these young subjects. In infectious diseases, with the exception of diphtheria, I scarcely ever use alcoholic stimulants. In diphtheria I do not begin their use at the outset of the disease, but am entirely guided by its course, and especially by the state of the circulatory and nervous systems.

DISCUSSION.

Dr. Holt.—I have only one remark to make. It concerns the very large quantity of alcohol which young children tolerate during diphtheria and broncho-pneumonia. I am almost afraid to mention the amount of alcohol which I have given some young children. Recently I treated a baby two months old, weighing about seven pounds, for a severe broncho-pneumonia. The child took for twenty-four hours

a teaspoonful of whiskey every half-hour, and for the two succeeding days almost as much. To a boy sixteen months old at the Infant Asylum, who had first pneumonia, followed by pleurisy with effusion, and then diphtheria, all in the course of a few weeks, with complete recovery, we gave half a pint of whiskey a day for several days; this, too, without producing any cerebral symptoms, although they were carefully watched for. It seems to me, therefore, that we should be guided in dosage by the effect produced, and not by any preconceived ideas as to how much the child ought to have.

Dr. Fruitnight.—To make a general rule to give alcohol in all cases of certain diseases is, I think, a great mistake, a mistake which has been made by not a few. I have also seen some cases in which there was marked tolerance of the drug. I have seen young children consume as much as a quart of brandy in twenty-four hours. The disease was diphtheria with marked toxic symptoms. Alcohol I regard as not only a stimulant, but as an antidote to symptoms of toxæmia in that disease, and administer it accordingly.

Dr. Vaughan.—I am rather sceptical as to medicines, and use but few, but alcohol is one that I believe in. I agree with Dr. Seibert when he says it is to be used as a medicine, and not as a beverage or food. But in the treatment of mild cases of diphtheria, and more especially in the typhoid fever of children, there has been no other remedy at my command so good as alcohol. In the typhoid fever of children the temperature often runs up as high as 105° to 106° F. Antifebrin will bring it down, but that is all the good it accomplishes, while it is liable to cause serious disturbances. Alcohol will not lower the temperature by any means as much as antifebrin, but it will bring it down a degree or two, and the patient sleeps better and takes his food better. In fact, I have never treated a case of typhoid fever in children without alcohol, so pleasant has been my experience with it. The same is true of milder cases of diphtheria. Where it disturbs the stomach it should be stopped, but I have never yet seen a case of typhoid fever or diphtheria in children in which it did cause disturbance of the stomach. I do not agree with Dr. Seibert that it should not be given by the stomach; I have never given it in any other way. Of course in adults we meet with cases in which it causes disturbance, and I agree with him that it should not be used where there is digestive trouble. There is no question but what alcohol is burned up in the body, especially when administered in the fevers. This was proved a long time ago, so that it cannot be doubted but what it preserves the tissues.

THE PRESIDENT.—Does Dr. Vaughan limit the use of alcohol in diphtheria to the mild cases?

DR. VAUGHAN.—It is the only thing I use in mild cases. Larger quantities are called for in severer cases, and other things as well.

DR. CHAPIN.—It is by diverse opinions that we sometimes reach conclusions. In my opinion, if there is any one disease in which alcohol is not necessary, it is typhoid fever in children. In the vast majority of cases it is an exceedingly mild disease, and, it seems to me, we do harm in giving alcohol to children when it is not necessary. I have seen a considerable number of cases of typhoid fever in children, and have never seen a death, and have never had a case in which I gave alcohol. In the milder cases of diphtheria I never give alcohol. I think we need to use alcohol, as one of the speakers has said, as a drug, and give it only when there is a direct indication; for instance, when the heart fails or when there is some grave toxic symptom. When indicated it is exceedingly valuable.

DR. VAUGHAN.—There are typhoid fevers and typhoid fevers. In Michigan I have found typhoid fever in children severe, and the temperature running often as high as 105° and 106° F., consequently my experience has been different from that of the last speaker.

DR. ROTCH.—It is an interesting statement that typhoid fever is of two different types in different parts of this country. In the East, I think, it is rather an aborted type compared with the disease as it appears in the adult, and we seldom expect a child not to recover from it. Put the children in bed, give them a milk diet, and they get well. I think it is very interesting indeed if there is an entirely different type of the disease in the West. Of course it would indicate different treatment.

DR. VAUGHAN.—In Michigan typhoid fever often runs forty-two days in children.

DR. CHAPIN.—I very rarely see a case last longer than three weeks, and the temperature does not usually go above 101° to 102° F. I have seen a good many cases of this character, and have simply put the patients to bed and given them milk.

DR. ROTCH.—The pathological changes have been noticed to correspond with the symptoms in mildness in the East, and the same thing has been observed in France. At one time it was supposed that Pyer's patches were not involved in infants, but it is now well known that they are. But the proliferation of cells in Pyer's patches does not go nearly to the extent that it does in the adult, and does not lead to ulceration. There-

fore it is extremely seldom to get perforation and hemorrhage in infants, and the disease in them runs a shorter course, sometimes only ten days. Of course there are some cases in which the temperature runs high, but the general type of the disease is very benign.

DR. CHAPIN inquired of Dr. Vaughan whether he had made any autopsies.

DR. VAUGHAN.—My cases get well. In many places in Michigan cistern water is used, and in the majority of cases of typhoid fever which I have seen cistern water was drunk. Perhaps that has something to do with the type of the disease. We call it typhoid fever. I have studied these waters diligently for germs, also the fæces of the patients. There is a germ in the water which will kill rabbits and rats every time, but it is not Eberth's germ. I believe there are different kinds of typhoid fever. The children out there do not die, but they have a great deal of delirium and high fever from the very outset; there is no eruption.

DR. CHAPIN.—Last summer I was in Michigan, in a town called Iron Mountain, where there was a severe epidemic of typhoid fever, fatal among adults, but I was told by some of the physicians that children were not very susceptible to the poison.

DR. A. JACOBI.—We have heard some of the indications for the use of alcohol in the diseases of children. I will mention some of the contraindications, and I do so because I remember a great many mistakes committed by others and myself. In fact the most inexcusable mistakes which I have seen made in the administration of drugs have related to alcohol. For instance, in most cases of brain-disease and brain symptoms to which I am called alcohol has previously been given. Alcohol has no business in the inflammatory diseases of the brain; it has no place in the treatment of kidney-diseases, either acute or chronic. If young physicians will remember these facts they will, I think, derive some benefit from this discussion.

But there are a great many cases in which alcohol can be given with advantage,—in convalescence from certain diseases and in chronic anæmia. But it should be diluted, for undiluted spirits or strong wine will certainly, as Dr. Seibert has said, affect the digestive powers of the stomach. But where there is no normal secretion of gastric juice diluted alcohol will certainly stimulate it. Then, in the anæmic person, old or young, there is not blood enough left from which to obtain gastric juice, and besides giving alcohol the digestive powers should be aided by pepsin and hydrochloric acid.

I also join those who have recommended large doses of

alcohol in infectious diseases. But if you call rheumatism an infectious disease, there it should be avoided. When there is an inflammatory irritative condition of the heart, alcohol will do harm, but when we have simply to do with insufficiency of the muscle, it will do good. In rheumatism, then, where there is always danger of endocarditis, alcohol will do harm. It will be of benefit in many cases of erysipelas. It will not do to administer it in those cases of scarlet fever in which there is so much tendency to brain disturbance. In short, wherever there is a brain affection alcohol ought to be avoided and some other stimulant take its place. These other stimulants are, particularly, camphor,—camphor in good doses.

In diphtheria you can not give too much alcohol. I pointed out that fact twenty years ago or more. You seldom succeed in making a baby with diphtheria intoxicated. When it becomes intoxicated it is about time to stop, for it is a sign that it is on the way to convalescence. I have found in many cases that where whiskey was not tolerated so well there was not much need of it, and I stopped it.

Another remark I would make is this: it is all very well to say not to give medicines unless there is an indication, but it depends on what you consider an indication. An indication for a stimulant certainly arises when heart-failure sets in, but then it is generally too late. The stimulant is indicated before heart-failure sets in. When you have to do with a disease which must necessarily last a time, and is known to have a tendency to produce heart-failure, it is much better to take time by the forelock, and not wait until you have heart-failure, for then it is likely to prove too late.

THE PRESIDENT.—I would ask Dr. Jacobi whether he does not think it too sweeping an assertion to say that alcohol should never be given in cerebral or meningeal inflammations. Within a week I have at my first visit in a case of cerebro-spinal meningitis advised the use of alcohol. The temperature of the patient was subnormal, the tongue brown, the extremities cool, the pulse a mere flicker; the disease had continued only two or three days. I depended upon brandy as the chief remedy. Should there not be an exception in a case like this? The patient had meningitis from a microbic cause, and was in a state of such extreme prostration that death was liable to occur at any moment. The patient was too weak to rise from the bed, or even to turn in bed without help. Frequent moderate doses of brandy with the cardiac tonics apparently prolonged life.

DR. JACOBI.—That looks like an exception, but I should prefer some other stimulant to alcohol even there. There is only one remedy which I fear as much as I do alcohol in in-

flammatory brain diseases, that is caffeine. I have used a great deal of alcohol and a great deal of caffeine, but I avoid them under the circumstances I have pointed out. When a general stimulant is indicated; when there is not only a flickering pulse and heart-failure, but the possibility of brain irritation is present, would it not be better to give camphor, or camphor with sparteine? It is not necessary to wait for the action of the stimulant given through the mouth. When the whole system is depressed, the pulse but a flicker, we cannot expect the stomach to secrete gastric juice to digest food, or to absorb anything which may be sent into it. Therefore it is that so many remedies, whether given in small or large doses, are absolutely inert. The stomach does not know what to do with them. In the case described by the president I should use camphor subcutaneously. Where death is imminent it cannot be better averted than by giving a medicine subcutaneously. Dr. Earle will forgive me for advising this mode of administration, which after all is but seldom painful, for it is certainly better to give medicine under the skin than to write a certificate of death.

A FATAL CASE OF PURPURA, WITH A FEW NOTES ON THE RECENT LITERATURE OF THIS DISEASE.

BY HENRY JACKSON, M.D.,

Boston.

On June 13, 1888, I was called to see a boy five years old, who lived in a house with good hygienic surroundings. The house was situated on a wide street, on the sunny slope of a hill. The parents were in good circumstances, and the boy well cared for in all respects. His previous health had been good. In the latter part of May he had a mild attack of measles. Since June 10, his mother had noticed that he did not seem well. He had been "feverish" at night, had been constipated, and on the previous day she saw a few hemorrhagic spots. He had not been confined to the bed since the attack of measles, mentioned above, and at the time of my visit was playing in the yard.

Physical examination.—The child did not appear sick; his

color was good; he was rather peevish, otherwise nothing abnormal was noted in his general appearance. Examination of heart and lungs negative. Pulse, 80; temperature, 99.5.

On the legs were numerous small hemorrhagic spots, a few on the back; several of the spots were half an inch in diameter. On the lower lip was a small hemorrhagic bulla. During the day he passed a little blood with a dejection; in the evening there was no material change in the boy's general condition. Pulse, 100; temperature, 102.

June 14.—Having passed a good night, he had at 6 A.M. a sudden profuse nose-bleed, accompanied by vomiting of blood; at 10 A.M. there was a recurrence of the hemorrhage. At 11 A.M. his pulse was 180, small, and very hard to count; his countenance was pale, and the mucous membranes were livid. The hemorrhage had been so profuse that the child and the room were literally covered with blood. He hardly spoke, and made no complaint of pain. There was no evidence of intercranial hemorrhage. Through the day he had several attacks of nose-bleed, vomited blood, and passed blood from the bladder and bowels.

June 15.—The hemorrhages from the mucous membranes continued; temperature subnormal; pulse very small and thready; skin cold and clammy. He was apparently moribund.

June 16—The hemorrhages from the nose, stomach, bladder, and bowels continued. The spots on the skin had increased in number, and on the legs were numerous large confluent patches of hemorrhage. The pulse could scarcely be felt; temperature subnormal; extremities very cold and clammy. Death at 6 P.M. No autopsy allowed.

We have here a case of purpura in a child previously healthy, ending fatally on the fourth day from hemorrhage from the mucous membranes. I consider this case as properly belonging to the type of purpura recently described as purpura fulminans, though it differs from the typical cases of this variety in that extensive hemorrhages from the mucous membranes were associated with the wide-spread purpuric eruptions of the skin.

This form of purpura is mentioned by Van Harlingen in

Keating's "Cyclopædia of the Diseases of Children," and spoken of as very rare.

Under the name purpura is classified a disease, or, perhaps, a group of diseases, whose chief manifestation consists in the occurrence of hemorrhages of various size on the skin or mucous membranes. It must be diagnosticated from petechiæ, occurring secondarily in the various acute infectious diseases, measles, scarlet fever, small-pox, etc., septicæmia, malignant endocarditis, or in poisoning from certain drugs. Wide-spread lesions, due to flea-bites, may closely simulate purpura, though this condition is rarely met with in this country.

As to the nomenclature, I quote from Carl Koch, who says (*Jahrbuch für Kinderheilkunde*, Bd. xxx., S. 403), "In the Nicolai Hospital we no longer distinguish, as formerly, purpura simplex and purpura hæmorrhagica, or morbus maculosus Werlhofii, but we include both forms, which differ only quantitatively under the name purpura. Herein we follow the example of most modern authors." Koch gives a valuable aid to diagnosis in doubtful cases; as in purpura a slight prick of a pin is followed in a day by a well-marked hemorrhagic spot, he chooses a place free from any lesion, and makes five very slight pricks, as in the diagram, in a geometrical figure ⁝∴. On the folllowing day these points will be marked by five well-defined hemorrhagic spots. Also slight pressure, as from a small coin bound firmly on the skin, gives rise to a hemorrhagic spot.

During the last few years two diseases have been described, and, on account of the occurrence of petechiæ in each, placed under the head of purpura,—namely, purpura fulminans (Henoch) or purpura foudroyant (Hervé), and a form, described by Henoch, as occurring with pains in the joints, large hemorrhagic areas, and attacks of colic, accompanied by vomiting of blood and bloody diarrhœa. In the latter form the chief characteristic is the recurrence of the attacks of gastro-intestinal disturbance at intervals of one or more weeks, often for several months. V. Dusch (*Deutsche Medicinische Wochenschrift*, 1889, S. 918) gives two cases, both ending in recovery, and suggests as appropriate the name purpura recurrens. Henoch has had two cases of this nature, which ended fatally; but, as

there was no autopsy in either case, he is unable to give an opinion as to the cause of the gastro-intestinal hemorrhage, purpura fulminans or purpura foudroyant.

Under this head a few cases have been described in the last three years. All the cases are similar in several important points: 1. Sudden onset of the disease without prodromata. 2. Usually pain in one or more of the limbs. 3. In addition to the purpuric spots of the usual size, the legs, or occasionally an arm, have been found swollen, œdematous, and dark purple. 4. Absence of hemorrhage from the mucous membranes. 5. Death in twenty-four hours to three or four days. In three reported autopsies no sufficient cause of death was found. Henoch (*Berliner Klinische Wochenschrift*, No. 1, 1887, S. 8) reports two cases of his own, and speaks of two others under the care of Charron and Michaelis:

I. Boy, five years old, on second day after the crisis, in a normal case of pneumonia, had suddenly pain in one leg, followed in a few hours by a large purpuric spot on the thorax. In a few hours there were large and numerous hemorrhagic spots all over the body; the right leg became cold, œdematous, and dark purple. Death in twenty-four hours.

II. Girl, two weeks after scarlet fever; suddenly numerous small hemorrhages in the skin; left arm dark bluish; both legs œdematous and swollen. Death in twenty-four hours. As in the previous case, the autopsy gave no sufficient cause for death.

Strœm (*Jahrbuch für Kinderheilkunde*, Bd. xxvii., S. 180) and Arctanda (*Ibid.*, S. 181) give similar cases.

Rinonapoli (*Archivio di patal. Infant.*, 1887, p. 200) gives the following case: A healthy boy, two and a half years old; no previous illness. He had suddenly a swelling of the right knee, which, at first red, became dark purple. Two days later there was an abundance of petechiæ and black all over the body. Death on third day. Autopsy gave no sufficient cause for death.

Hervé (*Rev. Mens. des Mal. de l'Enf.*, April, 1888) gives a similar case, which Van Harlingen has reviewed in Keating's "Cyclopædia," vol. ii. p. 83.

Gueilliat (*Union Med. du Nord Est*) reports two cases.

In all, I have found ten cases or reports of cases.

It remains for future investigation to determine whether these cases have etiologically and pathologically any connection with purpura, or whether they represent some as yet unknown general infectious disease, whose chief symptom manifests itself by the occurrence of petechial hemorrhages similar to those of purpura.

Etiology.—In speaking of the etiology of purpura, Ziegler says, "Its cause is unknown." The sudden onset of the disease, often in individuals in perfect health, the occasional occurrence in mild cases of constitutional symptoms, and the occurrence of the rapidly fatal cases to which reference has been made, render it probable that we should class purpura among the infectious diseases. The following theories as to the cause of purpura have been suggested: 1, changes in the blood; 2, changes in the walls of the capillaries; 3, vaso-motor disturbance; 4, micro-organisms.

It has been pretty satisfactorily determined that there are no changes in the blood itself in purpura, either as to its power of coagulation or as to the size and number of the red and white blood globules, except in so far as the blood has been secondarily affected by prolonged hemorrhage.

It has been claimed by some pathologists that changes exist in the walls of the minute blood-vessels, especially endarteriitis or colloid degeneration. The clinical history of most cases of purpura suggests that such changes, if they exist, are secondary to and not the cause of the hemorrhage, as it is difficult to understand how a disease, so rapid in its onset as purpura, could be due to a chronic endarteriitis. Köjerer (*Zeitschrift für Klinische Medicin*, Bd. x. S. 23), after giving quite a full review of the etiology of petechial hemorrhage, gives a minute account of his examination of petechiæ in thirteen cases of hemorrhage of various origin; his analysis includes an examination of two cases of purpura. In all cases he found endarteriitis, minute thrombi, and extravasation of blood and blood-pigment.

In 1869, Weir Mitchell published in the *American Journal of Medical Science* an article on "Purpura as a Neurosis," in which he described two cases which he considered to be of

nervous origin. In each case there was redness and some pain, followed by hemorrhagic spots. While preparing this paper, I had the opportunity of observing in my own child a simple case of purpura, which I watched from hour to hour. She is a girl twenty-three months old, who has never been sick except in February, when she had a mild attack of measles. On April 7 she suddenly complained of pain in her left foot and right ankle. At these points there was a slight blush with swelling. The redness and swelling disappeared in half an hour, leaving a faint bluish discoloration. During the next few days several similar spots appeared on various joints, also a few petechiæ scattered over the body. After fifth day no new spots. No changes in her general health during the attack.

The occurrence of such cases where there is evidently some disturbance of the vaso-motor nerves, as evidenced by the pain and the preceding blush, and the usual rapid onset of purpura, render it probable that the petechiæ in purpura are in the main dependent upon some disturbance of the vaso-motor nerves. Physiological experiment has shown that lesions of the brain, cord, and sympathetic ganglia may all be followed by petechial hemorrhage in distant parts of the body. The theory advanced of the nervous origin of purpura is by no means opposed to the supposition that purpura is a disease of infectious origin, dependent upon micro-organism as an ultimate cause of the disturbance of the vaso-motor nerves.

Micro-organisms have been found in the blood and tissues by numerous observers. Watson Cheyne (*Brit. Med. Journ.*, 1884, vol. i. p. 362) has found micro-organisms in two cases of simple idiopathic purpura, in one case bacilli and in the other cocci. Similar observations have been made by Balzer, Klebs, and Letzerich.

Two men, Petroni and De Guimard, have found micro-organisms in purpura, and succeeded in reproducing the disease in animals by inoculation.

In neither case have I had the opportunity of consulting the original article, but have found reference in Schmidt's *Jahrbuch* of 1888–89.

Petroni (*Rivista Clin. di Bologna*, 1883) injected blood from cases of purpura into rabbits and guinea-pigs, with the result of producing wide-spread purpura, which could be transferred through several generations. In the blood and internal organs Petroni found micrococci, easily stained, which he could cultivate on nutrient media. The work of Martin de Guimard (*Thesis*, Paris, 1889) appears to be more reliable than that of Petroni. De Guimard examined twelve cases of purpura, occurring in one of the children's hospitals of Paris. These cases varied in type from the mildest form of purpura to the most severe, ending in death in a few days, as in the cases described as purpura fulminans. In all he found micrococci in the blood, subcutaneous tissues or submucous tissues. Cultures of these cocci were made, and found to produce purpura on injection into rabbits. So far as I have been able to find out, De Guimard did not inject the blood from cases of purpura directly into animals, but used only his cultures as a medium for inoculation; and herein his experiments are more reliable than those of Petroni.

To sum up: Purpura is a disease manifesting itself clinically in petechial hemorrhages of greater or less size and number. Its pathological cause may be found in some lesion of the vaso-motor nerves, which recent investigations have shown to be possibly, and perhaps probably, due to the invasion of micro-organisms.

DISCUSSION.

Dr. Earle.—A question has arisen in my mind as to a possible cause of a fatal case of purpura hæmorrhagica in a patient which recently came under my observation. It was in a child whom I had treated for whooping-cough the past winter. During the course of the treatment, inhalation of carbolic acid and tincture of iodine were freely used.

Remembering that carbolic acid poisoning sometimes occurs from the use of the spray, the question suggested itself whether this agent may not have produced a change in the blood favoring or producing purpura. I would ask whether any of the members have had experience in this direction?

Dr. Booker reported a fatal case of hæmatophilia in a child eight months old. There was no history of bleeding in the family.

The child was recovering from an attack of summer diarrhœa. It was reduced in flesh but not emaciated, and was very nervous and restless. The four central incisors had cut through the gums; the gum covering the two upper lateral incisors was swollen and hard. No spots were noticed on the body of the child, and the joints were not swollen or tender.

A superficial incision was made over the upper lateral incisors, from which a small quantity of blood was lost at the time. The oozing of blood continued, and all efforts to stop it proved unavailing.

The oozing was repeatedly checked for a short time by digital pressure, but would again break out, and sometimes, when checked over the incisions, the blood would ooze out between the upper central incisors and gum; and near the close this happened around the lower central incisors.

The child repeatedly vomited blood and passed it with the fæces.

On the second day bluish spots were noticed over the body and extremities. The blue color gradually changed to purple.

The pulse remained remarkably good for three days.

Death occurred on the fourth day. Autopsy showed nothing abnormal. The heart was healthy and of normal size. Spots resembling those on the skin were noticed on the intestine and vermiform appendix.

Dr. Jacobi.—One single remark. Nobody would now look for the cause of purpura in the blood. He would look for it in the blood-vessels. It must, then, be either in the anatomical structure of the blood-vessels or in an invasion by a micro-organism. There are a number of conditions in which severe bleeding has taken place and in which the anatomical state of the blood-vessels has been studied. For instance, the acute fatty degeneration of the newly-born, first studied by Buhl and Hecker. Here are found a large number of hemorrhages through the viscera, etc., caused by acute fatty degeneration of the epithelium and endothelium, and extending into the tissues proper. In purpura we may have—at least in some cases—a similar condition. I have not the slightest doubt, however, that in a number of cases we shall find the cause to be an infectious disease. Measles are known to affect the walls of the blood-vessels very much more than any other infectious disease. I remind you simply of the fact that noma is more frequent after measles than after any other disease. It occurs now and then, however, after typhoid and

scarlet fever; thrombic deposits in the extremities and large hemorrhages of purpuric nature also occur after measles. I have seen a number of such cases, and others are to be found in the books and journals. Dr. Jackson has referred to two cases which occurred after measles. According to the pathological notions which prevail now, we believe there must be a bacterial invasion. It is possible the bacterial invasion of measles is exactly the one which predisposes the blood-vessels to become pervious.

Dr. Earle.—Are we to understand Dr. Jacobi to say that there is no change in the blood, particularly in the blood corpuscles, observable under the microscope?

Dr. Jacobi.—What I meant to say was that, no matter what the condition of the blood, no change in it causes hemorrhage. In order to have hemorrhage there must be a change in the blood-vessels, whatever it may come from. That a change in the state of the blood itself will not cause hemorrhage is easily proved. For instance, a person may be either very plethoric or very anæmic, yet not have hemorrhage. The blood may be very watery, but hemorrhage will not take place unless the pipes burst.

Dr. Rotch.—This is an extremely interesting subject to me. I have not had time to publish my cases. I have yet to see a baby under one year, especially under six months, recover from purpura hæmorrhagica. And I have yet to see a baby under two years affected by any other disease recover when attacked with this disease. I suppose we have to separate the hemorrhagic diathesis from purpura, at least at present. Purpura hæmorrhagica may possibly be not the follower of an infectious disease, but an infectious disease itself, the children dying because they are unable to withstand the amount of blood lost. The younger the child the less the amount of blood it can afford to lose.

In none of my cases, perhaps five or six in number, had there been any disease like measles. One especially was a blooming baby of six months; the mother and father both perfectly well and strong, with other strong children. The baby was taken down with purpura hæmorrhagica, and died within forty-eight hours. I stayed with it during that time, and was unable to do anything whatever to arrest the hemorrhage. I hardly believe carbolic acid had anything to do with Dr. Earle's case.

I wish much to know how to treat these cases. I have to go back to-night and see a little baby five months old, whose life I value more than that of any other patient, yet I believe it is developing purpura hæmorrhagica, and will die notwith-

standing it is now taking its food and doing thoroughly well.* It is an exceedingly fatal disease. How would you treat it?

DR. KOPLIK said that in intense sepsis there had sometimes been observed hemorrhages over the body, sometimes in the intestine; and some authors were disposed to look upon purpura hæmorrhagica as a species of sepsis. When Dr. Booker related his case he had involuntarily thought of sepsis taking place through the incision into the gums. There seems to be a change in the endothelial cells of the capillaries—or the cement substance between them—in this condition, which permits of a diapedesis of red blood-cells. I think that in the future we will look for some avenue of entrance of infectious matter which hitherto has escaped notice; in other words, for a septic cause. I need hardly mention the petechia occurring in connection with rheumatism as probably due to some *infectious* influence.

THE PRESIDENT.—Among other causes, in asylum practice, we recognize syphilis.

DR. FRUITNIGHT.—I can recall two cases which were most positively due to septic infection. Both occurred in the second week of life, anterior to the days of antiseptic practice. In one case there was over the left parietal bone a spot of ecchymoses as large as a silver dollar. There were smaller spots over the body, and spontaneous hemorrhage from the umbilical apperture. In the other there was malignant jaundice, and its system was profoundly affected with infectious material, besides, it had numerous purpuric spots over its body. Both mothers suffered from puerperal fever due to septic infection.

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* This baby died about three weeks later.

OBSERVATIONS UPON THE CAPACITY OF THE STOMACH IN INFANCY.

BY L. EMMETT HOLT, M.D.,
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THE subject of the quantity of food to be allowed to artificially-fed infants is second in importance only to the character and preparation of the food given. It is only within very recent times that this factor in the problem has been deemed worthy of much consideration.

So many contradictory statements have been made by different writers with regard to the capacity and growth of the stomach in infancy that it has seemed worth while that this point should be made the subject of a special investigation.

Sound knowledge in this direction will certainly bring us a little nearer the solution of the difficult problem of deciding how much an infant, of a given age, is to be fed.

Methods employed.—The observations here recorded have been made at autopsy. It is not so simple a matter as might be imagined to arrive at accurate data regarding the size of this organ. Its walls are found at autopsy in conditions widely differing from each other; sometimes very flabby and altogether relaxed, containing food in large or small amount; sometimes so tightly contracted that its cavity is almost obliterated. It has been difficult to compare these two classes of cases.

An amount of internal pressure, which would stretch a relaxed stomach to twice its vital capacity, is in many cases entirely insufficient to dilate a contracted organ to anything like its proper size. It was found thus to be unreliable and unsatisfactory to subject the organ in every case to the same hydrostatic pressure. After numerous experiments the most satisfactory plan appeared to be the following: One orifice, usually the pyloric, was closed by a ligature, and water intro-

duced into the other opening by means of a piece of rubber tubing attached to a faucet, at the other end of which was a glass nozzle, which was passed into the stomach, the cardiac orifice being pinched tightly around this by the fingers. After the contents had been evacuated, the water was allowed to flow very slowly and the stomach distended up to the point of obliterating the rugæ of the fundus and body of the organ. The walls in infants are so thin that it was found not difficult to determine when the proper degree was reached by looking through the stomach at a strong light. This proved quite satisfactory for those cases in which the stomach was contracted.

When the stomach to be measured was much relaxed, it was found that by allowing it to remain a day or two in fifty per cent. alcohol it could be much more easily handled, and the "bagging" from the weight of water contained usually avoided. This last feature mentioned was found a very serious obstacle in large stomachs, but unimportant in small organs.

These seemingly insignificant details are mentioned since, unless great care is taken, very misleading and erroneous results might be obtained.

Results.—In connection I have measured personally the capacity of the stomach in one hundred and forty-two infants. Thirty of the earlier cases I have not included in the tables, as the method of measuring was, I found later, not quite trustworthy. Of the remaining one hundred and twelve cases, seventeen were over fourteen months old, and distributed through quite a range of months.

There remain for study ninety-five cases of fourteen months old and under, and they are taken seriatim.*

In the following chart can be seen at a glance the results arrived at in the individual cases.

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* I wish to express my indebtedness for many specimens to Dr. W. P. Northrup, pathologist to the New York Foundling Asylum, and to Dr. Clarke, the house physician; also to Dr. W. F. Martin, curator to the Infants' Hospital on Randall's Island.

CHART

Showing age and capacity of stomach in ninety-five infants.

CAPACITY IN OUNCES.

Age.	1	1½	2	2½	3	3½	4	4½	5	5½	6	7	8	9	10	11	12	13	14	15	16	17
Birth	4	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Half-month	1	5	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	[1]
One month	...	1	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
One and a half months	1	...	3	6	1	...	...	...	[1]	...	...	...	...	...	...	...	...	...	...	...	...	...
Two months	...	...	1	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Two and a half months	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Three months	...	...	...	...	...	...	3	1	1	1	...	...	...	[1]	...	...	...	...	...	...	...	...
Three and a half months	...	...	...	...	...	1	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...
Four months	...	...	...	...	...	...	...	1	...	...	3	...	...	...	...	...	...	...	...	...	...	...
Four and a half months	...	...	...	...	...	...	2	1	2	...	...	...	...	...	[1]	...	...	...	...	...	...	...
Five months	...	...	...	...	...	...	...	...	1	1	2	...	...	...	...	...	...	...	...	...	...	...
Five and a half months	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...
Six months	...	...	...	...	...	...	...	...	1	3	3	...	1	...	...	...	...	...	...	...	...	...
Seven months	...	...	...	...	...	...	...	...	...	...	2	2	2	...	...	...	...	...	...	...	...	...
Eight months	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	...	...	...	...
Nine months	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ten months	...	...	...	...	...	...	...	...	...	...	...	...	3	2	...	...	...	...	...	...	...	...
Eleven months	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...
Twelve months	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Thirteen months	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	1	...	...	...	...	...	...
Fourteen months	...	...	...	...	...	...	...	...	...	...	1	...	1	...	2	1	...	...	...	...	...	...

In four cases, indicated by brackets in the chart, the capacity so far exceeded all the other cases of the age that it was considered pathological dilatation, and these cases are not included in the table of averages given below, the object of the present inquiry being to discover the size of the organ in health.

TABLE

Showing average capacity of the stomach in ninety-one cases.

Age.	Number of cases.	Average capacity.		
Birth	5	1.2	Ounces.	
Half-month	7	1.5	"	
One month	4	2.0	"	
One and a half months	11	2.27	"	
Two months	4	3.37	"	
Two and a half months	2	4.25	"	
Three months	6	4.50	"	
Three and a half months	3	5.00	"	
Four months	4	5.62	"	=5 Average
Four and a half months	5	4.50	"	
Five months	4	5.62	"	
Five and a half months	2	5.25	"	=5.75 "
Six months	8	5.94	"	
Seven months	6	7.00	"	=6.88 "
Eight months	3	6.66	"	
Nine months	...	...	...	
Ten months	5	8.40	"	=8.14 "
Eleven months	2	7.50	"	
Twelve months	1	9.00	"	
Thirteen months	4	8.75	"	=8.9 "
Fourteen months	5	9.00	"	

In looking at this table we are struck with the fact of the very rapid increase in the size of the stomach during the first three months. In this period it has quadrupled in capacity. From this time, however, its growth is much slower, so that in comparing the cases by half-months, the results seem in several cases to be contradictory; the average, for example, being less for four and a half than for four months, and less for five and a half than for five months. If, however, from three and a half months we group the cases by periods of two months each, as has been done in the right hand column, the regular but slower increase in size is at once apparent.

Taking into consideration the great distensibility of the stomach, the varying conditions in which it is found after death, the differences in children from whom the statistics are taken,—some nursed, others artificially fed, some dying of acute, some of chronic disease,—the variations found in children of the same age are not surprising; rather, they are just what would be expected. General correspondence, however, between the age and capacity is very clearly shown.

To formulate in a few words a general statement of the facts here brought together, we may say,—

1. That, starting at birth with a capacity of about one ounce, the stomach increases in size at the rate of one ounce a month during the first three months, reaching at this time about one-half the capacity seen at one year.

2. From three to eight months its growth is much slower, being, on the average, about half an ounce a month.

3. From eight to fourteen months the rate of growth is still less, being, on the average, about one-third of an ounce a month.

Approximately, *at the ages of one, three, six, and fourteen months, the capacity is, respectively, one, four and a half, six, and nine ounces.*

These figures express, of course, only averages. The usual variations met with above and below the average are indicated in the chart. It is to be expected that in unusually large children the stomach will be a little above, and in unusually small children somewhat below the average capacity. It was a frequent source of surprise that these variations were so small.

The capacity of the stomach and the body-weight.—The child's weight was obtained in seventy-five cases. The attempt was made to obtain the maximum weight during life, but circumstances made this impossible in many of the cases, so that we were often obliged to take the last weight before death. As some of the children died from acute disease after but a few days' illness, and others of chronic wasting diseases, such as athrepsia and tuberculosis, an element of uncertainty enters into the calculation upon this point, and the figures cannot be looked upon as altogether exact.

Eight children weighed seven pounds. The capacity of the stomach in one case was one ounce; in two cases one and a half ounces; in one case two ounces; in one case two and a half ounces; in one case four ounces; in one case five ounces; and in one case six ounces.

Ten children weighed eight pounds. The capacity of the stomach was in one case one ounce; in one case three ounces; in three cases four ounces; in one case four and a half ounces; in two cases five ounces; in one case five and a half ounces; and in one case six ounces.

Six children weighed nine pounds. The capacity of the stomach was in one case one ounce; in one case four ounces; in one case four and a half ounces; in two cases five ounces; and in one case eight ounces.

Seven children weighed ten pounds. The capacity of the stomach was in one case four ounces; in one case four and a half ounces; in one case five and a half ounces; in one case six ounces; in two cases seven ounces; and in one case eight and a half ounces.

Eight children weighed twelve pounds. The stomach held in one case five ounces; in one case five and a half ounces; in one case six ounces; in one case six and a half ounces; in one case seven ounces; in two cases eight ounces; and in one case ten ounces.

It is needless to multiply examples further. Enough have already been given to show that no inference as to the capacity of the stomach can be drawn from the body-weight.

Practical deductions.—It certainly does not follow that because the capacity of a child's stomach, at a certain age, is six ounces he should always and everywhere be fed such a quantity, regardless of other circumstances. We may, however, safely assume that the amount of food allowed for a single feeding should not be very much greater than the capacity of the average stomach at that age. It may be urged that milk or other fluid food passes so quickly from the stomach into the intestine that the size of the former is no guide to the amount of food which can be disposed of at one feeding. I am not aware that any one has as yet been able to measure how much actually passes the pylorus during the first fifteen or twenty

minutes, which is the average feeding-time for a child nursing or taking the bottle.

I have found by experiments with stomach-washing that, in infants with apparently good digestion, two hours were usually required before all the milk had left the stomach, in the case of infants of one or two months; in those of from five to eight months the time was generally about three hours.

Considering the changes which the milk undergoes in the stomach, it does not seem likely that any considerable proportion leaves the stomach before the meal is completed, certainly not enough to affect the conclusions here drawn.

It is of great interest to note in this connection the very close correspondence between the results here reached as to the size of the stomach and the quantity of food advised for a single feeding at the different ages by one who has studied with great care the question of infant-feeding in an experimental and practical way.

The amounts given by Dr. Rotch, in his article in Keating's "Cyclopædia" (vol. i.), are almost identical with my own findings in regard to the size of the stomach for the same age. We have both by entirely different paths come to the same conclusion.

It is undoubtedly true that many children take food greatly in excess of these amounts, some apparently without any harmful consequences, but this is by no means true of all. The stomach is an organ of extreme distensibility. I found by repeated experiments that almost any stomach could be easily distended up to from two and a half to three times its original capacity. In one case a stomach of five and a half ounces capacity was distended until it held twenty ounces. Dilatation takes place almost as easily during life. An instance has come under my observation in which a delicate infant of four months, weighing only ten pounds, was receiving, by the physician's orders, twelve ounces at each feeding, and eight feedings in twenty-four hours. The child was losing in weight at that.

It will be seen from the chart that among the ninety-five cases there were four in which a degree of dilatation existed sufficient to be regarded as pathological. How frequently this

is present in cases which we see only clinically we are not as yet able to say. It is highly probable that this is an important factor in the dyspepsia of infancy very much more commonly than we appreciate.

In conclusion, these investigations have shown that there is a fairly constant relation between the age of the infant and the capacity of the stomach. I believe that if we take this capacity as a guide to the amount of food to be allowed to an average infant in health we shall not go far wrong.

DISCUSSION.

DR. ROTCH.—I think a great deal of credit ought to be given Dr. Holt for his investigations. They were exceedingly difficult to carry out, I know. What he has put in the diagram certainly does not represent all the work he has gone over. It is a very difficult matter, indeed, to measure the capacity of the infant's stomach. The results which Dr. Holt arrived at correspond very closely with those which I had arrived at when I wrote my article on feeding. A very interesting point is the rapid growth of the infant's stomach. When you get up to the fourth, fifth, or sixth week it grows very rapidly. In artificial feeding it is necessary after reaching the fourth or fifth week to rapidly increase the amount of food until about the fourth month. Then it seems the stomach comes to a stand-still in its growth for about two months, and begins again at the sixth or seventh month with the capacity Dr. Holt has given. These facts have a good deal of importance in artificial feeding. The amount of food should not be increased so rapidly after the fourth month as it had been during the second, third, and fourth months.

Dr. Holt did not bring up the question of methods of measurement. Of course, simply to say what the stomach holds is not safe to depend upon, but I presume he has other methods not mentioned for determining the stomach's capacity and for correcting errors. I believe something can be gained by weighing the children before and after nursing.

DR. SEIBERT.—As early as 1881, Biedert published his first article to determine the amount of food an infant should have by weighing it. His experiments were entirely of a chemical and physiological character.

Dr. Holt's measurements are of great interest. As some of those present may know, I have weighed somewhat over two hundred infants to determine simply in a clinical way how much food, and of what composition, would be best digested

irrespective of age. The conclusions which I arrived at were somewhat different from those of Dr. Biedert. He laid down a law for all children, while I have found, as Dr. Rotch has, that after children have reached a certain weight, it is best to give the same quantity of milk a greater length of time. According to my experience, after a child weighs eleven pounds it ought to have the same quantity as when it weighs fourteen pounds. A point which I would make is, that the actual capacity of the stomach is by no means the measure of its digestive ability.

I have the stomach of an infant in my pocket. The infant weighed seven pounds and a half. According to my experience, and the small table which I have devised, it should have received three ounces of food. The stomach holds by actual measurement four ounces. Thus we readily see a vast difference between the actual measurement and the digestive ability. I am sure some stomachs are dilated. I have seen a great many children with dilated stomachs which were not able to digest more than one or two ounces, while others whose stomachs were much smaller could digest twice the quantity and do well.

I am satisfied that neither the actual measurement of the stomach after death, nor the actual weight of the child during life, nor the heat measurement estimated by the skin surface, as has recently been done in Germany, will alone serve as a proper guide in infant-feeding. I think we probably ought to consider all these things. It is well, as Dr. Holt has remarked, to have our attention called to the fact that the age is only to a certain extent a guide in infant-feeding.

Dr. Earle.—I would ask Dr. Holt what he has found to be the position of the stomach in infants. The text-books picture it as in nearly the vertical position the first weeks of life. I would ask Dr. Holt whether that is true.

Dr. Holt.—I have never yet seen a stomach in the vertical position. It is usually directed somewhat obliquely.

Dr. Rotch.—The frozen sections show the position of the stomach beautifully. It is not so much transverse as it is oblique in position. What Dr. Holt said about the greater length of the stomach on the larger curve is interesting, and offers one explanation for difficult digestion in that the food cannot pass on, so to speak, into the duodenum.

I think the age has a good deal to do with the amount of food which a baby takes. There is no doubt but that, of two babies of the same age, the one weighing ten and the other twelve pounds, the latter will, as a rule, take the greater amount of food.

DR. HOLT.—I did not mean to draw the inference that this chart should be used as an absolute guide in infant-feeding. That was not the purpose of the investigation. It was simply intended to ascertain how this corresponded with other methods of investigation to determine the amount a baby should be fed, —whether it tallied with our previous observations or contradicted them was not the point. Of course it is not an absolute guide. I undertook the work because I thought it needed to be done, and could not find that it had ever before been done in a satisfactory manner.

DR. A. JACOBI.—Experiments to determine the size of the stomach have been made long ago, as the author knows, by Fleischmann and Ahlfeldt. The first by inflating, drying, and measuring the stomach. The latter by simply weighing the children before and after taking a meal. Dr. Holt knows it is only an approximate value that can be obtained by these methods, and for one good reason,—namely, that it is impossible to say the inflated stomach is exactly the stomach which was present during life. On the other hand, if you weigh the child before feeding and after, it does not show the capacity of the stomach at all. If for no other reason than that during the ten or fifteen minutes the child is swallowing its milk absorption is constantly going on. At least the water will be absorbed. If during a meal the child takes three ounces, at no time will all the three ounces be in the stomach. I appreciate the work which has been done highly, but we must not forget that the values are only approximate. Nor do I believe we need anything more, or that we can ever get nearer the exact facts than Dr. Holt has succeeded in doing.

DR. ROTCH.—Regarding weighing the infant before and after feeding, I should hardly think it would make any difference whether the food was in the stomach or had been absorbed. The object is to find out how much the baby takes at a given age. It is not in that case a question of the size of the stomach, but what is the proper amount to give it. If, for instance, we found the increase in weight after a meal was two hundred grammes in a large number of cases at a given age, we would say two hundred grammes was the proper amount to give at that age.

DR. JACOBI.—I understood it was a question of how much the stomach held at a given age.

RESULTS OF ASPHYXIA, OF SHORTER OR LONGER DURATION, IMMEDIATELY AFTER BIRTH (WITH PRESENTATION OF CASE).

BY A. JACOBI, M.D.,

New York.

I HAVE been encouraged to show this child to-day, because of a letter received only yesterday with reference to a similar patient I had seen some time ago. The case which I saw at that time was that of a child semi-paralyzed in the muscles of the extremities, face, and neck, with insufficient intellect. No cause could be found at that time. I had asked whether the child had been asphyxiated when born, for I have seen scores and scores of cases in which epilepsy or idiocy could be accounted for only by the presence of asphyxia, of shorter or longer duration, immediately after birth. A postscriptum to the letter which I received regarding that case last night states that the doctor who attended the mother in her confinement said, "The navel cord was around the infant's neck, and he had quite a time to get it off before it was delivered," so that I have not the slightest doubt the cause of the semi-paralysis and insufficient cerebration was a somewhat prolonged asphyxia at birth.

The case now presented is of a similar description, and it is for that reason I thought it would be of some interest to you. It is that of a girl four years and eight months old. The mother has had nine children, all healthy except this one. There were four years and a half between this one and the preceding child. There had been no miscarriage. The husband was healthy. It was reported that the baby was blue at birth,—asphyxiated. She has now blue spells, as they call it, followed by marked weakness. The first attack was when she was eight months old. They have recurred at irregular intervals. There has been no laryngismus stridulus. Such is a part of the record.

But there is something else in this case. The child has developed very slowly. The parents knew from the beginning that the child was not like the others in the family. There was very little intellectual development; the child took very little notice of things; it did not smile, nor move the limbs

at the usual time. The second year the baby did not hear at all. She grew up with incomplete use of the limbs and very little brain. You notice the child's head is not of the usual form. It is undoubtedly brachycephalic; between the root of the nose and the neck the distance is shorter than normal. The root of the nose is very much contracted; the vomer comparatively short (the usual appearance where the base of the skull is very short). This shortness, as a rule, is due to premature ossification between the sphenoid and occipital bones.

This, then, is a mild case of cretinism, meaning in most cases a peculiar form of rhachitis, complicated with premature ossification at the base of the skull. Thus this baby suffers on account of two facts, asphyxia at birth and cretinism, a complication which renders the prognosis for the whole duration of life very unfavorable. On the etiological importance of asphyxia I wish to make a few remarks.

You know that the undeveloped condition of the blood-vessels and of the cranial bones of the newly born are the usual causes of cephalohæmatoma, still many cases of this anomaly, and particularly the more dangerous ones, are avoidable. For there is no doubt in my mind of this, that the pressure of the forceps produces many. Altogether the effect of that instrument has been estimated with too great leniency. When I was young I was taught, and even at present it is claimed, that it acts by traction only, and not by pressure. The fact is that it must, by its very pressure between the head and the pelvis, diminish the contracted space; that it compresses the head is but too plainly seen by its traces left on the surface, with or without suffusion, abrasions, and local indentation. By so doing it strains, presses, tears blood-vessels, and there can be no doubt that hemorrhages follow many an application of the instrument. The frequent connection of external and internal hæmatoma endangers the brain to a great extent. Still, to engage in this subject thoroughly is prohibited by the limited time of this meeting. Therefore I confine myself to copying the following extract referring to the question whether instrumental delivery is a cause of idiocy.

Drs. Winkler and Bollaan have written a paper in a Dutch medical journal on "The Forceps as a Cause of Idiocy."

They mention a case of bilateral, almost symmetrical, damage to the cortex of the brain found in an idiot. The boy had been born with the aid of forceps. Only part of the vertex could be examined. There were no marks of the forceps, yet there were strong reasons for belief that the injury was caused by them. In another case there was still more ground for the opinion that injury had been caused by forceps. In this child, who was an idiot from birth, there were marks of the forceps on both sides of the skull corresponding almost exactly to the damage done to the brain. This coincidence was too remarkable to be accidental. Drs. Winkler and Bollaan performed necropsies on ten idiots, and examined twenty-five living idiots, of whom six had bilateral depressions in the skull. Another case was that of a woman born with the aid of forceps, an inmate of the Utrecht Asylum for four years. She was very short, being only one and twenty-seven-hundredths metres high, and small in proportion. She could make all movements, isolated movements being difficult. There were but two words which she could say, and she never gave any sign of understanding what was said to her. She died at the age of sixty, and at the necropsy the brain was found to be very small, weighing only seven hundred and forty two grammes (25 ounces). All the organs at the base of the brain, the optic nerves, olfactory nerves, etc., were found to be very small. Deep depressions were found on either side of the sagittal suture, the right being the more indented. The depth of the depression was two millimetres, and its greatest breadth twelve millimetres. The brain was much atrophied. The authors believe that depressions of the skull caused by instrumental delivery, even when no fracture occurs, tends to damage the cortical substance of the brain, and that this leads to general atrophy of the hemispheres, thus producing idiocy. They are disposed to think that the use of the forceps is much more frequently the origin of idiocy than is generally supposed.

It is, however, but just to say that, when we remember that it is indeed pressure which gives rise to hemorrhage (and thereby serious cerebral consequences), and, further, that there are more fatal cases from prolonged labor than from forceps, and that a great many fœtuses, beginning to die *in utero*, are kept

alive by the speedy use of the forceps, this instrument may still be less guilty.

The real cause of the cerebral disturbance is traumatic injury of cerebral tissue, or hemorrhage, or, at all events, circulation rendered abnormal for a shorter or longer time.

This takes place in asphyxia, or suspended or interrupted animation. It destroys a great many new-born infants that would live but for it; it results in meningeal and encephalic hemorrhages, which either prove fatal in the earliest period or give rise to permanent paralysis. It works still worse results, for death is nothing compared with what asphyxia often results in,—viz., idiocy or feeble-mindedness.

Among the idiotic or feeble-minded children there are those who are evidently predestined to that intolerably grave and unfortunate condition. Some cases depend on premature ossification of the sutures and fontanels; when this has been completed at birth, or soon after, there is no possible hope. Others result from defects of the brain, following either an arrest of development or an embryonic or fœtal meningitis or encephalitis. A certain number of them are recognized by positive cerebral symptoms, such as partial or total paralysis, an unusual degree of strabismus or nystagmus. Others again exhibit anatomical changes about the head closely connected with the aberrations in the structure of the brain; for instance, the horizontal ramus has an obtuse angle, the roof of the mouth is gothic or flat, the ear is in closer proximity to the occiput, its helix or lobule absent, the eyes are oblique and too close together, the epicanthic folds flabby and deep. They cannot be prevented or treated by the obstetrician.

There are other cases of idiocy found in apparently normal children. Head and face are well formed, but they are those of idiots, nevertheless. In the course of a third of a century I have seen many hundreds of that class; my attention was early drawn to them, indeed since 1858, when I published my observations on premature synostosis and its pathological and diagnostic importance. Not a month will elapse but I have to pass sentence on such a case either in my office or the clinic. A great many of these idiots are first-born children of a family; the majority are boys. It struck me that the pro-

longed parturition of the first child, and the larger circumference of the male head, must be held responsible for the injury befalling the brain. In not a few cases the delivery had been terminated by forceps; in a very large percentage the history of asphyxia, more or less protracted, was readily obtained.

I have no figures to present, but no student or medical man attends my clinic for any length of time but hears the record of such a case. In J. Langdon Down's experience (*Transactions Obstetrical Society*, London, 1876) forty per cent. of the idiots who were first-born children had a history of asphyxia.

After its existence has been stated to you, the connection of asphyxia and idiocy is so clear that I need not detail it; asphyxia results in congestion, effusion, thrombosis, extravasation, destruction of nerve-tissue, secondary inflammation, and cystic degeneration. The longer the duration of asphyxia the greater the danger. Some of you, who have worked over the inanimate body of a newly-born baby ten minutes or an hour, and finally had the nameless joy of resuscitating the infant, have been rewarded by enriching the stricken family with a hopeless idiot or epileptic. Asphyxia of long duration is always dangerous; a brief one may be so, but it promises better results. Thus no asphyxia must be left unattended for a second. A few moments gained may save life, or what is of more importance, intellectual health. Thus the immediate treatment of asphyxia is the highest duty of the obstetrician.

THE CONSTRUCTION OF O'DWYER TUBES, WITH A REPORT OF THREE HUNDRED AND FIFTY CASES OF INTUBATION OF THE LARYNX.

BY DILLON BROWN, M.D.,

New York.

SINCE the introduction of intubation in the treatment of stenosis of the larynx, by Dr. Joseph O'Dwyer, it has been my lot to see a great many cases, and it has been my good fortune to be intimately associated with its inventor during this time.

The object of this paper is to present some practical points

derived from my experience, and to call special attention to the many badly-made tubes, and to the dangerous modifications of them, which not only cause permanent injury or death to the patient, but bring great disrepute upon one of the most brilliant and valuable operations of modern times.

The difficulty of the operation is often greatly underrated, and the importance of a wide experience in the treatment of these cases is seldom appreciated. Although it requires but a few seconds to insert the O'Dwyer tube, and the immediate results are most brilliant and gratifying, I know of no operation in surgery which is more brutal and shocking than the efforts of an unskilful man to intubate. With each miserable attempt, the child grows more frightened and more cyanotic, the face and clothes become smeared with blood, and, unless the operator is an unusually cool one, he loses his wits and does fearful damage to the larynx. This picture is neither overdrawn nor rare, and I venture to state that the great majority of deaths which have been reported as due to pushing down membrane was the result of unskilled efforts, and due either to apnœa from prolonged attempts at introduction, or to asphyxia from forcing the tube through a false passage.

O'Dwyer and I have operated upon over six hundred cases, and neither of us have ever had a death on the table due to pushing down membrane. It may be true that some men find but little difficulty to intubate, even without previous practice on the cadaver, but this is certainly exceptional. It seems odd that a writer should say that "any surgeon possessing a knowledge of the anatomy of the parts and a good degree of surgical skill will be able to easily and quickly introduce the tube, and to remove it when the proper time arrives," in direct contradiction to a statement in the same article that in attempting to remove the tube, he "made a complete failure" and deferred the operation till next day. Another man writes that in the first case he was at work nearly half an hour before he succeeded in introducing the tube, but in the second case he introduced it in about five minutes. Ten seconds would be a liberal allowance of time in which to do this operation. Many other examples could be given both from the literature of the subject and from my own personal knowledge.

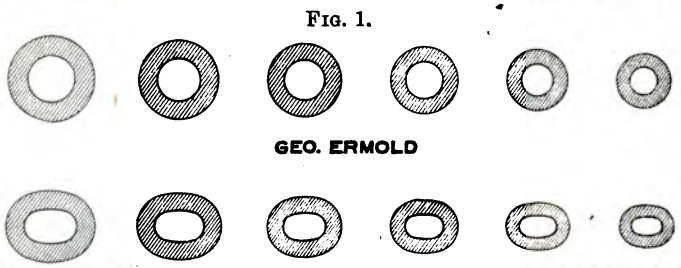
To understand the value of a large experience you must encounter some accident or unusual feature. When membrane is pushed down before the tube, or it is loose in the trachea or bronchi, how shall we get it out before the child chokes to death? Its importance is seen in this and many other questions which constantly arise, and the solution of which depends entirely upon individual judgment and experience.

INSTRUMENTS.

There are three distinct sets of O'Dwyer tubes: one for children, containing six tubes; one for adults, containing ten tubes (although three tubes only are necessary for any form of *acute* stenosis in adults); and a third one, to be used only in children, for foreign bodies or loose membrane in the larynx. The set for adults differs from the well-known children's set in size only; but the tubes for foreign bodies differ very materially from the others.

O'Dwyer tubes.—The small tubes are made of brass, and then heavily plated with gold. The adult tubes are made either of brass (gold-plated) or of hard rubber, each material having special advantages over the other. The details of their manufacture are as follows: Through a solid rod of brass, a hole of the proper size is bored, and then hammered on a mandrel, so that the outline is elliptical and the antero-posterior

FIG. 1.



Cross-section of tubes, natural size, before and after being hammered on a mandrel.

diameter of the opening is about twice its lateral diameter. It is thus made to conform to the shape of the larynx, and the greatest possible air-space is obtained with the least pressure upon the vocal cords. The next step is to file down the tube, so that it has the shape of a double wedge, the belly standing out laterally. By this means the tube is held in position and

prevented from being coughed out. In taking away the extra metal, the walls of the tube should be made as thin as possible, except at the anterior surface of both the upper and lower ends, where considerable metal should be allowed to remain. This enables the instrument-maker to round off the upper end, which presses against the base of the epiglottis, and which would otherwise be sharp and cause ulceration at this point. It also allows him to round off the lower end and do away with the sharp, cutting edge, which would otherwise cause ulceration of the anterior wall of the trachea, from the up-and-down motion of the tube with each act of deglutition.

FIG. 2.

Lower end of tube, showing the rounded and thickened anterior edge.

No matter how carefully the upper end is made smooth, there will be deep ulceration at the base of the epiglottis, due to pressure, if the tube is perfectly straight. This pressure is obviated by removing a wedge from the posterior edge of the tube, near the head, and, after knocking it back, it is firmly soldered in this position. The head, which is made in a separate piece, is now fastened over this. This head should be oval-shaped, and every part of it rounded off and smooth, so that there are no sharp edges to cut into the tissues. The hole for the string is now drilled through the head, just to the left of its anterior edge. It should not open into the calibre of the tube, for it would then offer a rough spot as a nucleus for the accumulation of secretions. The whole tube is now polished and heavily gold-plated.

FIG. 3.

Tube in rough, after removal of wedge-shaped piece.

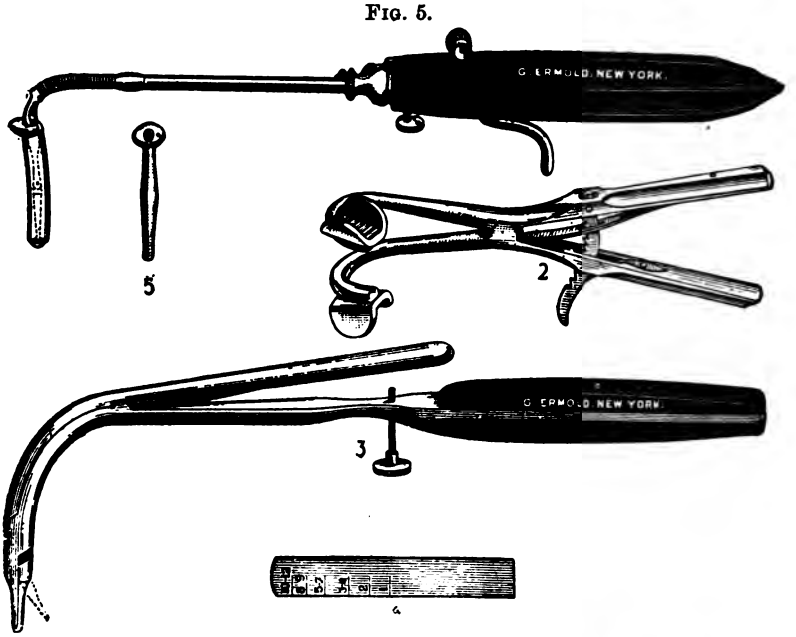
The outside measurements are as follows: The length of all the adult tubes are the same,—namely, three inches. The lengths of the croup-tubes are $2\frac{5}{8}$, $2\frac{1}{2}$, $2\frac{1}{4}$, 2, $1\frac{3}{4}$, and $1\frac{1}{2}$ inches, respectively; the antero-posterior diameters are $\frac{12}{32}$, $\frac{11}{32}$, $\frac{10}{32}$, $\frac{9}{32}$, $\frac{8}{32}$, and $\frac{7}{32}$ of an inch; and the width at the point of greatest swell, $\frac{12}{32}$, $\frac{11}{32}$, $\frac{10}{32}$, $\frac{9}{32}$, $\frac{8}{32}$, and $\frac{7}{32}$ of an inch, respectively.

FIG. 4.

Head of tube.

The tubes for foreign bodies and loose membrane in the trachea and bronchi are made of very thin German silver, and are all short and of the same length,—namely, $1\frac{1}{8}$ inches. The head is small; there is no retaining swell, because the tube is held in position by pressure from its large size, and the upper end of the tube is not thrown away from the epiglottis by taking out a wedge-shaped piece, because it is designed to let it remain in the larynx a few hours only. For the same

FIG. 5.

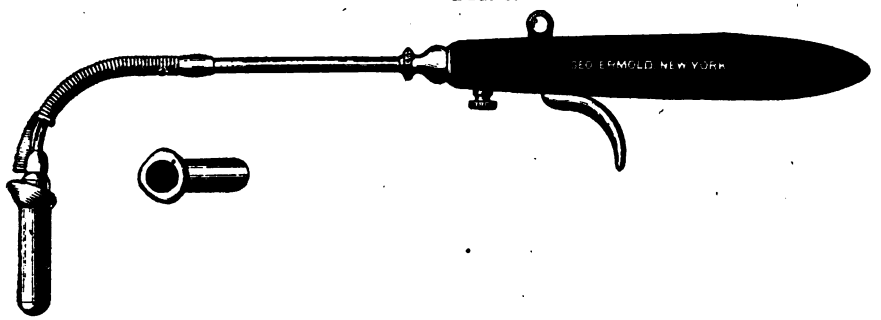


Correct set of croup-tubes.

reason, there is no objection to its lower edge being sharp, although during insertion the obturator should make a perfect probe-point with the tube. This set consists of seven tubes. They are cylindrical, but slightly smaller in calibre at their lower end. The diameter of the smallest one is $\frac{7}{32}$ of an inch, and there is an increase of $\frac{1}{32}$ of an inch with each tube. These tubes are intended to fill the larynx to its full sub-glottic capacity; and it is confidently believed that any foreign body which could enter the larynx would be able to pass out through one of them, except those that increase in size by the absorption of

moisture. In the management of loose membrane in the trachea and bronchi, it is the most satisfactory method that I am familiar with; and, if some means can be devised for detaching and breaking up the partly-adherent membrane, I believe that it

FIG. 6.



Set of tubes for foreign bodies or loose membrane in trachea and bronchi.

will give us the solution of this problem,—the most difficult that forces itself upon the attention of the intubator.

In the use of these tubes, one warning should be strongly emphasized, namely, that they are kept in the larynx not by a retaining swell, but from their great width by direct pressure upon its narrow parts, and therefore if they are allowed to remain in position more than a few hours deep ulceration will be the consequence.

FIG. 7.

Obturator.

Obturators, gag, etc.—The obturators are made in four pieces. The shank is jointed to facilitate its removal after the tube is placed in the larynx. The probe point, which is soldered to its lower end, must fit the tube so snugly that no rough edges are left to catch membrane and push it down. The greatest diameter of this tip should fit exactly at the edge of the tube, otherwise it will fail to present a perfect probe-point, and it will cause difficulty in withdrawing the inserter. This is especially true of the tubes for foreign bodies, and great care should be taken to scoop away all that portion of the tip which remains within the body of the tube. The head of the obturator should fit the tube for some little distance to prevent it from wabbling antero-posteriorly.

The O'Dwyer *gag* has been modified by Denhard, Dennison, Sajous, and many others, but the simplest and most satisfactory is that of Denhard, the construction and use of which can be seen in the figure. The *scale* is an arbitrary measure, which enables the operator to select the proper tube. The tube which reaches the line marked 1 is intended for a child up to that age; the tube which reaches the line marked 2 is intended for a child up to that age; and the same for the lines marked 3 to 4, 5 to 7, and 8 to 10. The largest tube is intended for children who are more than ten years old but have not reached puberty. Of course, much individual judgment is sometimes called for in the selection of the proper tube to use, and it may be necessary to take a larger or smaller tube than the one indicated by the scale.

The *thread* should be strong and made of braided silk. The twisted silk is apt to unravel so that, when it is withdrawn, it gets caught and pulls the tube out with it.

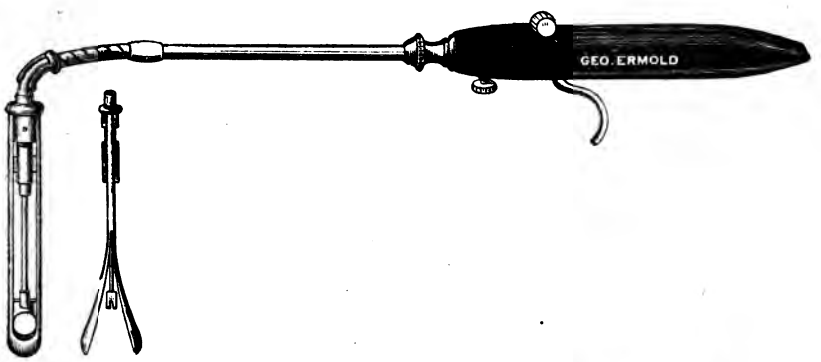
The *introductor* is usually made correctly, its construction being very simple. It can be taken apart and cleaned very easily. The only difference between the one for children and for adults is the size. However, in the set for foreign bodies it has a longer curve, and, instead of the two flanges on either side which push off the tube, it has a single one behind, which runs along a groove in the head of the obturator.

The construction of the *extractor* is rather complicated, but, with a proper one for a model, the maker should experience no great difficulty in copying it. Three very important points should be remembered. *First*, the jaw which moves when the instrument is opened should be the one nearest the operator, while the opposite jaw is a continuation of the handle. This greatly facilitates the removal of the tube, owing to its shape and direction. *Second*, when the jaws are closed, the end of the instrument should not be sharp, but should present a blunt probe-point, otherwise it will stick into the soft laryngeal tissues, and, besides making a false passage, will do great damage when it is opened. *Third*, no instrument should ever be used which does not have a regulating screw in the handle. It prevents the jaws from opening wider than is necessary, and it is of the greatest importance, even when the instrument is

used by the most expert operator. If the jaws are allowed to open to their full extent in the larynx of a small child, much damage will be done even if the instrument is not withdrawn. Of course in the latter case the injury is much greater, and it is possible in this way to split open the cricoid, so as to allow the tube to sink down deeply into the larynx, and might result in an abscess or some more serious complication.

Membrane extractors.—Many ingenious devices have been used for the removal of loose membrane from the trachea and

FIG. 8.



bronchi; but the problem remains unsolved. With the exception of the new foreign body tubes of O'Dwyer, every attempt in this direction has been an absolute failure, and even these tubes are only a step in the right direction. The apparently insurmountable obstacles which prevented the practical realization of Dr. O'Dwyer's ideas have been overcome by him, one after the other,—to prevent ulceration of the cords, to prevent the expulsion of the tube by coughing, to prevent ulceration at the base of the epiglottis and at the lower end of the tube, and the many purely mechanical problems which were constantly presenting themselves. More recently, the difficulty in feeding after intubation was solved by Dr. Casselberry, of Chicago, by the very simple means of posture, after many unsuccessful attempts with a complicated and often dangerous artificial epiglottis, or with various changes in the shape of the head of the tube. The power to get rid of loose membrane in the trachea and larger bronchi

will probably be obtained by means of the foreign body tubes, the link which is wanting being some method of breaking up the membrane and freeing it from its attachments in the bronchi.

The illustration shows a tube devised by Dr. O'Dwyer, which enables the trained nurse to quickly remove the tube with the finger in case of emergency. Its practical value has not been fully tested, and fortunately the necessity for its use is not frequently met with.

Fig. 9.

Tube with jointed head, which enables a trained nurse to remove it quickly in case of emergency.

Faulty tubes.—It is an impossibility, as far as O'Dwyer's experience and mine go, for an instrument-maker to copy a perfect tube unless the details of its construction are explained to him; and after this explanation, it is only with the greatest care, and after many failures, that they succeed. Therefore it is not surprising that the great majority of the tubes which are in use are imperfect and crude. Most of them will certainly do harm, and many of them will involve the life of the patient in great danger. These seem like strong terms, but they must seem very mild to those who understand the vast importance of having all the small details in the construction of the tubes made perfect, and who know how the country is being flooded with a great number of crude and improperly-made instruments.

The most common defect is the failure to throw the head of the tube away from the epiglottis by removing a wedge-shaped piece from its posterior edge. This neglect will positively cause ulceration, even to complete perforation, at the base of the epiglottis. Other common faults are rough points on the inner walls which form nuclei for the accumulation of secretions; a sharp lower edge which cuts into the anterior wall of the trachea with each act of deglutition; sharp edges on the head; and the failure to round off the upper and anterior portion of the tube.

The tube which I now show you was obtained from a physician, who returned to Mr. Ermold a perfect set of in-

struments, and sent this beautiful specimen as a model of the kind of tubes which he was accustomed to use and which he desired. It seems to possess every possible fault in the construction of an O'Dwyer tube and still retain a resemblance to one. It is a crude specimen of work, the lower end is sharp,

FIG. 10.

Evolution of the tube.

the body of the tube is perfectly straight throughout its length, the anterior portion of the head is not rounded off, the hole for the thread opens into the calibre of the tube, and the edges of the head itself are nearly as sharp as a knife. This type of instrument is unfortunately not rare, and it is no exaggeration to say that the majority of tubes that are used should never be placed in a larynx.

It is a curious fact that, as far as I know, every modified O'Dwyer tube has radical defects, and that every real improvement in the tube itself has emanated from the original inventor. These sketches give at a glance the evolution from the first tube (a simple wire frame, which was used only on the cadaver) to the shape now in use. It will be seen that the principle of almost every so-called new modification had been previously tried and found wanting.

The Stoerck tube is perfectly straight, it is rounded off neither below nor above, and is held in position not by a retaining swell, but by its great pressure against the sides of the larynx. The probe-point of the obturator is drilled with holes, and the advantage claimed for it is that the child can breath during the time of introduction. When we remember that it takes only a few seconds to do the operation, this rather theoretical gain is more than counterbalanced by its very glaring faults.

The Sajous modification has never been used in a living subject, otherwise it would never have been presented to the public. The bivalve principle was extensively tested by O'Dwyer, and it was found impossible to prevent such a tube from clogging up rapidly, usually in a couple of hours, and never longer than twenty-four. This is a serious defect, which would always count against any number of advantages, especially when they are purely theoretical. The modification of Dr. Thilo possesses the same fault, and, in addition, it is cylindrical.

Dr. Hoadley's suggestion, to insert the tube so that the posterior flange comes anteriorly, is certainly wrong; and deep ulceration at the base of the epiglottis will be the constant result. Even with a straight tube this will take place, as has been frequently demonstrated in the dead-house. The "deep-tubing" of the same writer, as done with modified tubes, has much to recommend it, if it overcomes the difficulty of swallowing. However, this is not so important, since Dr. Casselberry proved that this difficulty is absolutely obviated by posture. Hence, its advantage hardly compensates for the increased amount of pressure on the anterior portion of the larynx, and for the increased danger of the laryngeal tissues swelling over the top of the tube and obstructing it. The

cup-shaped head, to facilitate the extraction of the tube, seems to be an excellent idea. O'Dwyer used a funnel-shaped head very early in his experiments, but abandoned it, as he thought that it offered greater facility for the entrance of fluids in drinking. The question of long or short tubes can be settled only by experience. Each has its advantages in individual cases; but I am convinced that the long tube is preferable, for the reason that any loose membrane in the trachea is less liable to obstruct it (from a valve action), and, also, the long tube is retained more easily.

Tasher's tubes have no advantages that I can see, and have three serious drawbacks. The head and the lower end of the tube is sharp and presents a cutting edge, which will do damage; the laryngeal tissues will swell over its top on account of its deep position; and, the most important defect of all, it is held in place not by a retaining-swell, but by pressure against the narrow parts of the larynx.

The artificial epiglottis, which was first devised by Waxham, and has since been copied by others, increases the danger of asphyxia, both by presenting a nucleus for the accumulation of secretion, and by acting as a valve, which cuts off inspiration. Its usefulness was destroyed as soon as it was shown that a child could swallow perfectly well after intubation, if the head is placed in such a position that the pharynx is lower than the larynx. I believe that Waxham has abandoned its use.

It is frequently asked why the tubes cannot be cast, thereby reducing the price and obtaining uniformity in size and shape. It is impossible to do this in one piece, on account of the backward direction which the calibre takes near its upper end. Ermold has succeeded in casting a tube in two pieces, which are soldered together. However, it was found necessary to abandon their use on account of the rough spots or cracks which appeared in the tube, and formed nuclei for the accumulation of secretions. Even with the greatest care these defects could not be avoided.*

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* Ermold has apparently solved this problem in the most ingenious manner, but it is too early to make any positive statements.

Cases of Intubation.

Date.	No.	In the practice of	Sex.	Age.	Duration of laryngeal symptoms.	Duration of diphtheria.	Urine.	Cause of death.	Complications.	Result.
Nov., 1889.	301.	John H. Ripley.	F.	8 yrs.	3 days.	6 days.	Albumen.	Extension to bronchi.	.....	Died 2½ days after intubation.
Dec., 1889.	302.	W. J. Burnett.	F.	2 yrs. 8 mos.	3 days.	Pres.	Not examined.	Exhaustion.	.....	Died 2 days after intubation.
Dec., 1889.	303.	J. E. Claussen.	M.	5 yrs.	2 days.	Pres.	Albumen.	Extension to bronchi.	Measles.	Died 2½ days after intubation.
Dec., 1889.	304.	J. Lewis Smith and S. H. Dessau	M.	15 mos.	2 days.	Pres.	Albumen.	Extension to bronchi.	Rickets.	Died 1 day 7 hours after intubation.
Dec., 1889.	305.	C. E. Young and W. A. Fanning.	F.	16 mos.	2 days.	None.	Not examined.	Extension to bronchi.	.....	Died 1½ days after intubation.
Dec., 1889.	306.	G. D. Spor.	F.	4 yrs. 3 mos.	6 days.	7 days.	Albumen.	.....	.....	Recovered; wore tube 5½ days.
Dec., 1889.	307.	G. V. Hann.	M.	4 yrs. 1 mo.	4 days.	6 days.	Albumen.	Sudden heart-failure.	.....	Died 3 days after intubation.
Dec., 1889.	308.	W. Freudenthal and F. de Kraft.	M.	4 yrs.	4 days.	Pres.	Not examined.	Extension to bronchi.	Extension to bronchi.	Died 7 hours after intubation.
Dec., 1889.	309.	W. J. Burnett.	M.	16 mos.	3 days.	Pres.	Not examined.	.....	.....	Recovered; wore tube 7 days.
Dec., 1889.	310.	W. A. Fanning.	M.	17 mos.	5 days.	7 days.	Not examined.	Asphyxia without tube.	.....	Died 1 day after intubation.
Jan., 1890.	311.	G. A. Hayunga.	F.	6 yrs. 3 mos.	4 days.	10 days.	Albumen.	Extension to bronchi.	.....	Died 2½ days after intubation.
Jan., 1890.	312.	Nell O. Fitch.	F.	3 yrs. 5 mos.	2 days.	5 days.	Not examined.	Extension to bronchi.	.....	Died 4 days after intubation.
Jan., 1890.	313.	W. J. Burnett.	M.	13 mos.	1 day.	None.	Not examined.	Sudden heart-failure.	Measles.	Died 4 days 5 hours after intubation.
Jan., 1890.	314.	A. G. Gerster and C. F. Kremer.	M.	4 yrs.	2 days.	Pres.	Albumen.	Nephritis.	.....	Died 3 days after intubation.
Jan., 1890.	315.	J. Lewengood and A. T. Swan.	M.	5 yrs. 6 mos.	5 days.	7 days.	Albumen.	Extension to bronchi.	.....	Died 3 days 8 hours after intubation.
Feb., 1890.	316.	Leo Schnepp.	M.	13 mos.	2 days.	Pres.	Albumen.	Extension to bronchi.	.....	Died 3 days after intubation.
Feb., 1890.	317.	C. F. Kremer.	F.	2 yrs. 6 mos.	2 days.	7 days.	Albumen.	Nephritis; convulsions.	.....	Died 2 days after intubation.
Feb., 1890.	318.	G. A. Hayunga.	M.	5 yrs.	1 day.	5 days.	Albumen.	Slow heart-failure.	Sepsis.	Died 1 day after intubation.
Feb., 1890.	319.	J. Lewis Smith and F. M. Warner.	F.	17 mos.	2 days.	3 days.	No albumen.	Pneumonia.	.....	Died 5 days after intubation.
Feb., 1890.	320.	C. E. Young and P. E. Tiemann.	F.	2 yrs. 7 mos.	3 days.	Several days.	Albumen.	.....	.....	Recovered; wore tube 16 days 2 hours.
Feb., 1890.	321.	S. B. Allen.	F.	7 yrs.	2 days.	4 days.	Albumen.	Slow heart-failure.	Sepsis.	Died 1 day after intubation.
Feb., 1890.	322.	J. Lewis Smith and Joseph Anderson.	M.	3 yrs. 6 mos.	5 days.	Pres.	Albumen.	.....	.....	Recovered; wore tube 5 days 22 hours.

Mar., 1890.	323.	S. S. Jones.	F.	9 yrs. 6 mos.	1½ days.	Pres.	Albumen.	Extension to bronchi.	.....	Died 3½ days after intubation.
Mar., 1890.	324.	J. Harvie Dew.	F.	7 yrs.	1 day.	3 days.	Albumen.	Sepsis and extension.	Extension and sepsis.	Died 12 hours after intubation.
Mar., 1890.	325.	A. Jacobi and Leo Schnepp.	F.	3 yrs.	4 days.	.....	Albumen.	Pneumonia.	.....	Died 2 days after intubation.
Mar., 1890.	326.	H. Kolb.	F.	4 yrs.	5 days.	None.	Albumen.	Extension to bronchi.	.....	Died 4 days after intubation.
Mar., 1890.	327.	H. H. Curtis and J. T. Kennedy.	M.	7 yrs.	2 days.	3 days.	Not examined.	.....	.....	Recovered; wore tube ½ hour.
Mar., 1890.	328.	J. W. Stronach.	F.	4 yrs.	4 days.	8 days.	Albumen.	Extension and sepsis.	.....	Died 2½ days after intubation.
Mar., 1890.	329.	H. G. Lyttle.	M.	3 yrs. 3 mos.	2 days.	Pres.	Albumen.	Sepsis.	.....	Died 4 days after intubation.
Mar., 1890.	330.	J. W. Stronach.	F.	22 mos.	1 day.	Pres.	Not examined.	Cerebro-spinal meningitis.	Cerebro-spinal meningitis.	Died 2 days after intubation.
Mar., 1890.	331.	Edward Sanders.	F.	5 yrs.	1½ days.	Pres.	Not examined.	Exhaustion.	Measles.	Died 1 day after intubation.
Mar., 1890.	332.	E. J. Ware and H. Z. Pratt.	M.	2 yrs.	1 day.	7 days.	Albumen.	Slow heart-failure.	.....	Died 18 days after intubation.
Mar., 1890.	333.	S. S. Jones and C. W. Van Wert.	M.	9 yrs.	1 day.	None.	Not examined.	.....	.....	Recovered; wore tube 1 day.
Mar., 1890.	334.	E. M. Moffett.	F.	5 yrs. 6 mos.	4 days.	Pres.	Albumen.	Extension to bronchi.	.....	Died 1½ days after intubation.
April, 1890.	335.	Charles Schram.	M.	14 mos.	3 days.	None.	Albumen.	.....	Pneumonia.	Recovered; wore tube 19 days.
April, 1890.	336.	R. H. Buck.	F.	3 yrs. 7 mos.	4 days.	None.	Albumen.	Sudde heart-fail	.....	Died 1 day after intubation.
April, 1890.	337.	C. E. Young.	F.	3 yrs. 9 mos.	5 days.	7 days.	Albumen.	Sepsis	Sepsis.	Died 3½ days after intubation.
April, 1890.	338.	G. V. Hann.	F.	2 yrs.	2 days.	None.	Albumen.	Exten to bron	Scarlet fever.	Died 4 days after intubation.
April, 1890.	339.	E. W. Derby.	F.	7 yrs.	1½ days.	None.	Not examined.	.....	.....	Recovered; wore tube 5½ days.
April, 1890.	340.	J. C. Schmincke.	F.	28 yrs.	3 days.	5 days.	Albumen.	Extension to bronchi.	.....	Died 2 days after intubation.
April, 1890.	341.	M. M. Dunton.	M.	8 yrs. 6 mos.	4 days.	14 days.	Albumen.	Extension to bronchi.	Extension.	Died 12 hours after intubation.
May, 1890.	342.	J. A. McLoughlin.	M.	4 yrs.	2½ days.	Pres.	No albumen.	Asphyxia.	.....	Died 2 days after intubation.
May, 1890.	343.	R. B. Burton.	F.	6 yrs.	3 days.	None.	Albumen.	.....	Pneumonia.	Recovered; wore tube 6 days.
May, 1890.	344.	W. J. Gardineer.	F.	4 yrs.	5 days.	Pres.	Albumen.	.....	.....	Recovered; wore tube 6 days.
May, 1890.	345.	Henry Schroeder.	M.	2 yrs. 7 mos.	1 day.	3 days.	Albumen.	Extension and sepsis.	Sepsis.	Died 1 day after intubation.
June, 1890.	346.	My own.	F.	2 yrs. 4 mos.	4 days.	Pres.	Albumen.	.....	Scarlet fever.	Recovered; wore tube 6 days.
June, 1890.	347.	G. V. Hann.	M.	5 yrs.	1 day.	1 day.	Albumen.	Extension to bronchi.	.....	Died 2 days after intubation.
June, 1890.	348	J. A. Roth.	F.	22 mos.	11 days.	Pres.	Albumen.	.....	.....	Recovered; wore tube 16 days.
June, 1890.	349.	M. M. Dunton.	F.	6 yrs.	2 days.	6 days.	No albumen.	.....	.....	Recovered; wore tube 5½ days.
Oct., 1890.	350.	J. R. Conway.	F.	2 yrs.	3 days.	7 days.	Not examined.	Extension to bronchi.	Extension.	Died 1 day after intubation.

This makes a total of three hundred and fifty cases, with one hundred recoveries, or 28.5 per cent. The details of cases 1 to 200 were published in the *New York Medical Journal* for March 9, 1889; and of cases 201 to 300, in the *American Journal of the Medical Sciences* for 1891. During the period of time covered by the present report—namely, from November, 1889, to June, 1890—I saw six cases which recovered without operation. They occurred in the practice of Dr. W. J. Burnett, Long Island; Dr. C. E. Young, Dr. R. M. Cramer, Dr. W. A. Hawes and Dr. S. Baruch, Dr. D. F. King, and Dr. Joseph O'Dwyer. Two cases died without operation, one with Dr. J. A. McLoughlin and one with Dr. W. A. Hawes. Three cases died before my arrival, one with Dr. W. A. Fanning; one with Dr. DeWitt Hitchcock and Dr. B. G. Strong; and one with Dr. J. E. Kelly and Dr. J. J. Henna. It should be remembered that this does not represent the real number of patients which recovered without operation, but only the percentage of those cases in which the stenosis became severe enough to cause alarm and warrant a consultation to determine the advisability of operative interference.

"THE KENSINGTON,"
101 East Fifty-seventh Street.

DISCUSSION.

DR. EARLE.—I have nothing to say in the direct line of the paper, for I am one of those who cannot, who *cannot* intubate the larynx, and I am honest enough—and it does not take much courage either—to tell my professional friends in Chicago that I cannot do it. I think there are a good many of them who try to do it who should be as honest as I am, and acknowledge their inability. I wish to commend the first pages of the doctor's paper. For while I believe this matter of intubating the larynx is one of the most brilliant things which have been brought before the profession in years, and I am as proud as anybody can be that American physicians have had more to do with it than those of any other nation, yet I say with a great deal of sorrow and shame that there are, I believe, though perhaps not in New York, Boston, nor Philadelphia, a certain number of people going around trying to intube the larynx, but killing the children. I have seen some of the most barbarous, some of the most hor-

rid surgery that has ever been attempted, it appears to me, attempted by some of these people who thought that in order to be in the current they must intube the larynx. I do not suppose it is possible to compute the number of the instruments sold to physicians in our locality, and yet we have but two physicians who do the operation nicely. Dr. Maxwell does it without any doubt best of anybody west of New York, Philadelphia, and Boston. My friend, Dr. Brown, says he does it in about four or five seconds. I think Dr. Maxwell does it in five or six seconds. He does it so successfully that he is through before I know what I am about. I only commend the work of these gentlemen who have brought the operation to so perfect a state. I think this society should take some action to prevent everybody from undertaking it. The greatest blunders are made in trying to take the tube out. I have seen men plunge and go through all sorts of motions trying to find the tube, and sometimes they have had to do tracheotomy in order to find it. In fact, I am strongly of impression that a few of them have not been found to this day.

Dr. Caillé.—I can emphasize the difficulties in intubation to which Dr. Brown has called attention. It seems to me that every man who wishes to intubate should have the utmost confidence in his ability, and he cannot acquire that confidence, as a rule, until he has first practised on the cadaver.

There are one or two other practical points which I consider important. On putting the finger into the mouth to feel for the epiglottis, we frequently find it stiff and hard, while in other instances it is soft and pliable. In the latter cases the entrance to the larynx is usually free; you can feel the funnel-shaped entrance, and can introduce the tube without much difficulty. In the other instance, in which the epiglottis is stiff and hard, there is frequently membranous deposit over the epiglottis which extends low down, and in introducing the proper sized tube, say No. 4 for a seven year old child, you may happen to detach the membrane, and if you do not know how to manage afterwards, serious results may follow. In such cases I prefer to introduce a smaller-sized tube, which I lubricate with iodoform vaseline for the same reason that one would lubricate a sound before introducing it into the urethra. The vaseline has seemed to facilitate the introduction of the tube, although I must say that I have never experienced any difficulty in this direction.

Another point concerns the string. The string in the tube can be easily pulled out as a rule, but sometimes it "catches."

I have noticed that if you place your finger on the head of the tube and pull on the lower end of the string, it will come out easier than if you pull on the upper end. Therefore it is my custom not to tie the ends at all, but to leave the two ends loose without, and to tie a little knot in the lower string to distinguish it from the upper.

Another point relates to cleansing the tube. I have seen a great many dirty tubes, and I fear a good many filthy ones are introduced. The tube which has been used, and is to be used again, should be left in caustic potash solution twenty-four hours; it should then be thoroughly brushed with a bristle brush, and a string, or something of the kind, should be drawn through the small opening in the head. The tube should afterwards be washed thoroughly, placed in alcohol, and lit while some of the alcohol is still on it. That, I think, will thoroughly cleanse it, and if it is disinfected once more immediately before it is used, I hardly think any danger can result. The best plan of all is to employ a new tube for every patient.

SIMPLE BUT EFFICIENT MEDICATION IN PEDIATRICS.

BY CHARLES WARRINGTON EARLE, M.D.,

Chicago.

"To cure quickly, safely, and pleasantly" is a maxim which has come down to us from the ancients. In many instances I fear the entire proposition is forgotten, even that portion relating to the pleasant administration of remedies.

In choosing this as my topic I trust that no one will imagine for an instant that I am an advocate of the sugar-water school, or that I am a pessimist in regard to the action of drugs. On the contrary, I am daily surprised to see gentlemen in whom I have the greatest confidence, except when they practise medicine, trifle with disease, the pathological results of which are not only visible but palpable, in that they treat these conditions with alleged remedies which cannot by ordinary means or by chemical or microscopic methods be demonstrated as existing.

I believe in medication always, when needed, but at the same time belong to that class of physicians who believe it quite as much my duty to say to people, "You need no medicine whatever," if such be the case, as to prescribe an heroic dose when it is indicated. When, however, good diet, a better hygiene, more air and sunlight will not suffice to save, and it is necessary to give medicine, we owe it to our patients, particularly our little patients, to prescribe a drug or drugs so that they shall be cured not only quickly and safely, but, if possible, pleasantly.

I shall show, or at least attempt to show, that in many cases this is not done; that drugs are frequently given when they are not needed; that when needed, more than the amount necessary is frequently prescribed, and that when prescribed, absolutely no care, in many instances, is exercised to make the combination palatable.

In the first place, many cases to which we are called need no medication whatever; that is particularly true of first visits. There is a little irritative fever, a slight indigestion, a trifling nervousness, a few more bowel movements than usual, or the mother simply imagines in her solicitude that the baby is threatened with something. Many conditions similar to these are frequently seen, and they will recover,—correct themselves without medicine; indeed better without than with medicine. The diagnosis is frequently made by a parent, and the doctor is summoned to prescribe for a fever or for malaria, or for worms, and before he sees the little patient he has devised a combination of drugs for it. Something to reduce the pulse; to correct the secretions; something to regulate the excretions. How much better it would be for this little one to give it nothing, for in many cases the patient will be entirely well in a few hours.

During the premonitory stage in many diseases it cannot be determined what the child is to need for a few hours, and yet in a great number of cases several drugs are ordered only to be replaced by others, when in a few hours the indications are plain.

I do not advise against the administration of medicines when they are indicated; I know that by the judicious use of a drug, or drugs, diseases may be modified, a convulsion pos-

sibly averted. But the indication for its use should be clear, —we should not give a drug simply to make a show of prescribing.

In the second place, when a single drug is indicated we find in many cases too many prescribed, and a child's appetite destroyed and its nutrition impaired by the procedure. This does not apply to diphtheria, or any other disease which at times is local, and should be combated with vigor and promptness and frequency in order to keep it from becoming a general disease, but it does apply to that vast category of complaints where it is absolutely necessary to improve nutrition.

Take the general diseases, such as tuberculosis, scrofula, and rickets; in addition to the very best diet, good air, and surroundings, what I call the medicinal medicaments, cod-liver oil, malt, hypophosphites, etc., why the necessity of giving aconite for the fever, a little nitre because of its effect on the urinary secretions, or a little calomel for the liver? It is a loss of time, an infliction on the patient.

Again, take the eruptive fevers during the first stage: why give a little aconite or belladonna to reduce the fever? We want some fever; we all prefer a temperature of 102° to one at 98°. Why unload the portal circulation and in so doing probably irritate to a greater degree the already irritated mucous membrane of the alimentary canal? Look out for the throat in scarlet fever, which here will give more trouble than any other organ (excepting possibly the kidneys), and for the lungs in measles. This should, it occurs to me, be the rule in general. Do not waste time and annoy the patient by doctoring a symptom; attack the disease.

And then in convalescence,—how much it is retarded by the reckless administration of drugs. After a baby has passed through a fever, or some disease of the lungs, it does not need something to act on its liver or kidneys, or to clear up its tongue which is quite frequently normal when a little coated, or some alkali to correct a fancied acidity; but it does need something to eat, and it can't eat as long as the stomach is filled with nauseous medicines. This condition is well illustrated by a case I saw late in the year 1889. The child, around whom all the love and devotion and nonsense of a

young father and mother clustered, had the "Grippe." Its temperature had been rather high and the bronchial catarrh really severe. The attending doctor had diagnosticated pneumonia, and for this I was summoned. After a few days it began to convalesce, and I left it with the understanding that some restorative medicines, probably the hypophosphites with a little pepsin and possibly a minute dose of tincture of nux vomica, was to be administered. In two days I was recalled and was informed that the appetite was poor, the pupils dilated, the head was being thrown from side to side, and the doctor and parents were sure that cerebral congestion, if not meningitis, was present. By actual count that child was taking nine different drugs, hardly one of which was indicated. It was having bicarbonate of sodium, iodide of potassium, muriate of ammonia, tincture of aconite, tincture of belladonna, tincture of camphor, and a little opium, submuriate of hydrargyrum, to which should be added camphorated oil externally, supplemented and strengthened by a plaster of belladonna ointment. Is it any wonder that that child could not eat, that its pupils were dilated? The wonder to me is that it was alive. I solemnly declare that I have been more alarmed for fear that some doctors would kill their little patients with drugs than that the cases would terminate fatally from the disease.

We now come to pleasant medication. Of course, this is not by any means an easy task; sometimes it is impossible without sacrificing the usefulness of the drug. With care, however, we can do much; we can avoid prescribing large mixtures, can stop giving tablespoonful doses, and in many instances give our tinctures in water. Happily the custom of ordering four-, six-, and eight-ounce bottles of medicine has nearly ceased. It should be stopped entirely except in those cases where tonics and cough-mixtures are given, when it is necessary to see a patient but seldom. In acute sickness it is usually quite all that is needed to prescribe one-ounce and occasionally two-ounce mixtures. In the administration of most of the tinctures, particularly aconite, veratrum, digitalis, as well as Fowler's solution, etc., where the dose is from a fraction of a drop to one or two drops, it is best for the young physician to carry the drug and measure out enough at each

visit for the coming twenty-four hours. This gives a pleasant medicine, and it is also economical, and to young practitioners it is a custom which will make them friends. It is good practice, too, for physicians to always be ready to give the first dose of medicine; it may not be much, but it convinces the people that you are ready for emergencies; this I say more particularly to those young in the profession.

I have already indicated the manner in which most of the tinctures may be given so as to be pleasant. A fraction of a drop of the tincture of opium (enough for the young infant) can always be given in water; quinia by inunction, in tablets, with chocolate, or in syrup of licorice.

The syrupus ferri iodidi should always be given in glycerin. This conceals the taste fairly well. The hypophosphite and malt preparations are not refused by children, and the same may be said of many children in regard to Scott's emulsion of cod-liver oil or hydroleine.

With a little care we can treat a case running through several days, if not weeks, with but little display of drugs. Nothing makes the people appreciate the expensiveness of a doctor so much as, at the end of two-weeks' sickness, having a table full of bottles partially emptied. And nothing disgusts the patient to such an extent as to witness the doctor every morning commence to write his usual two or three new prescriptions; a part only at most will be taken, the remainder to go to make up the tableful, which is to be removed at the conclusion of the sickness.

I have treated a typhoid in a child, the sickness continuing three weeks, with three half-ounce bottles of medicine,—tincture of veratrum viride, tincture of opium, and aromatic sulphuric acid.

Pneumonia is well treated with quinine, with possibly an arterial sedative, and later, with the mild stimulants and tonics. Diphtheria, from first to last, with tincture of iron, bichloride of mercury, and alcohol.

Many additional details could, of course, be suggested, but this is hardly necessary. If we give the matter thought, I am sure we may have a much more simple, yet efficient, medication for children.

DISCUSSION.

DR. CARR (speaking of the palatableness of drugs).—I think it is well also to consider the vehicle. We may give a drug which in itself is only slightly disagreeable, but make it much more so by giving it in a vehicle distasteful to the patient. To some children peppermint mixtures are so disliked that we cannot get them to take a very simple medicine when flavored with this aromatic. The same is true, in other cases, of winter-green and cinnamon. Very often it is just as well, instead of using these flavors, to give the drug in simple water or glycerin, or something as nearly tasteless as possible, instead of in a heavy syrup which may not be palatable and may cause indigestion.

DR. L. E. HOLT.—It seems to me there is one point in prescribing which cannot be too much insisted upon, that is the use of single drugs instead of compound mixtures. We are not likely to reach accurate knowledge in therapeutics until we use drugs singly. Acting on this idea almost exclusively for the last three or four years, I have been much surprised at the better results, in gastro-intestinal diseases in particular.

DR. SEIBERT.—I would call attention to the desirability of giving drugs by the rectum, when, on account of the disagreeable taste or other reason, it is not well to give them by the mouth. For the last three years I have seen many cases of nflammatory rheumatism in children, and in not one have I given any drug by the mouth, but have always been able to cure the cases with salicylate of soda in watery solution injected into the rectum by means of a small syringe. Within the last year I have engaged in a discussion, I think in Baltimore, with regard to the best way of giving quinine to children. I have since learned, in a consultation with Dr. Jacobi, that it is quite safe and possible to give muriate of quinine in watery solution, one to thirty, injected into the rectum, provided no acid is used in diluting it. Only last week I saw a child with typical intermittent fever; large doses of quinine were well retained in the rectum. Iodide of potassium can be given in the same way, also digitalis, and I have never given antipyrin in any other way to children. We not only thus avoid forcing a disagreeable drug down the child's throat, but also save the stomach.

DR. KOPLIK.—I like to give quinine—which, as we all know, is so disagreeable to some children—by the rectum, as I have learned to do from Dr. Jacobi. I first gave it in this way to adults, at a time when Dr. Jacobi used tartaric acid to dissolve the sulphate. But now I simply dissolve the bisulphate

in water. I have become convinced in dispensary practice that it is one of the most useful methods of administering a disagreeable drug. In fact, it is sometimes the only recourse one has in the intermittent fever of small children.

DR. FRUITNIGHT.—The paper is along the correct line of practice. With regard to the accumulation of bottles, that can be avoided by ordering only a small quantity of a drug, and, if necessary, have it repeated.

SUPPURATIVE PERITONITIS.*

BY JOHN J. REID, M.D.,

New York.

THE following brief report of a rare case of suppurative peritonitis is of interest on account of its rarity and on account of the tolerance shown by the peritoneum to a large accumulation of pus.

A girl, five years of age, came under the observation of Dr. F. A. Thomas, of this city. The symptoms strongly suggested typhoid fever. At the end of the first week tympanites, diarrhœa, and abdominal tenderness were noted. During the second week dulness was found to exist over the lower portion of the abdomen. This gradually increased till, at the end of the fifth week, the abdomen was greatly distended and resembled a case of ascites. There was considerable prostration. I was suddenly sent for at this time, and found that rupture had taken place at the umbilicus, and that pus was flowing very freely from the opening.

I washed the peritoneum out with warm water, and repeated the operation on the following day. A compress was then placed over the abdomen. The child did well, and the washing was not repeated. Within a brief period the child was about as well as usual.

The regret in the case was that there was not an opportunity to see the case as often as could have been wished, but the facts presented show that pus must be considered as a possible cause in peritoneal distention.

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* Read by title.

A CASE OF CONGENITAL INFLUENZA.

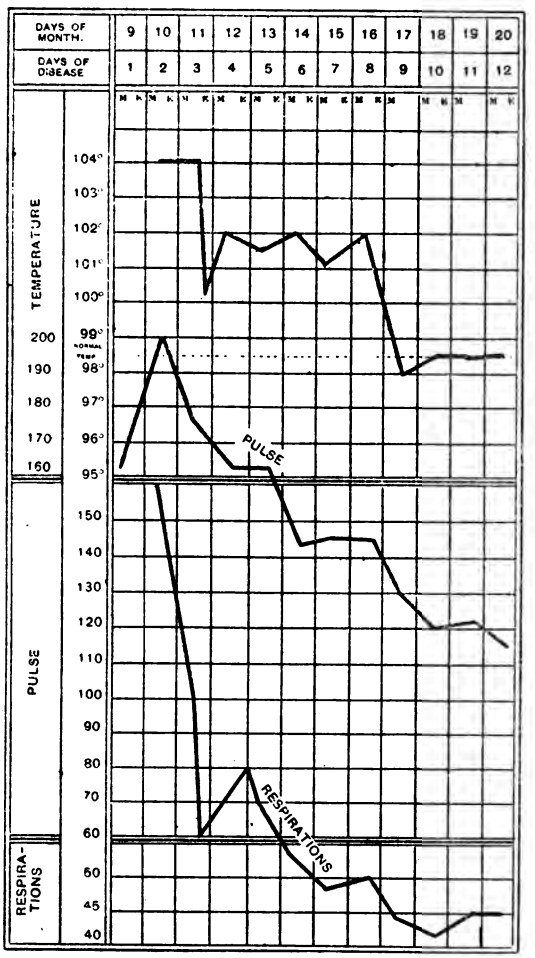
BY CHARLES W. TOWNSEND, M.D.,
Boston.

MRS. P., a healthy primipara, thirty-one years old, had a mild attack of influenza, beginning January 2, 1890, when the epidemic of that disease was at its height. She was ill for three days, and on January 9, or a week after the beginning of the attack, she gave birth, at full term, after an easy labor, to a boy baby weighing seven and a half pounds. Nothing unusual was noticed about the baby except that its heart-beat—counted *in utero*—was 164,—high for a boy,—and that it sneezed violently soon after birth eight or ten times, although it was wrapped in a shawl. It cried and inflated its lungs well. In the evening the respiration was about 100, and accompanied by a slight expiratory moan. On the second day its temperature was found to be 104°, the pulse at least 200, and the respiration 120 to 160, with an expiratory grunt or moan. The baby was unable to nurse on account of shortness of breath, and was very restless and fretful. Nothing abnormal, however, was to be found on examination of the chest or abdomen.

As will be seen by the chart, the temperature fell to 102°, where it remained from the third to the eighth day, dropping suddenly to normal on the ninth day. After the third day the pulse and respiration improved, and the baby seemed nearly well, with the exception of its elevated temperature. An occasional cough and slight attacks of sneezing daily were the only symptoms. At no time were abnormal signs to be found in the chest. The recovery was complete.

The symptoms and the temperature chart suggest acute lobar pneumonia, and congenital cases of this disease have been reported, the infection coming through the mother. In this case, however, the physical signs of pneumonia were absent, and

we have the history of a preceding attack of influenza in the mother, the disease in the child starting at birth. In other cases falling under my observation where influenza occurred just before labor, the babies were born free from the disease.



In the *British Medical Journal* for March 1, 1890, page 477, a somewhat similar case is reported by J. Kingston Barton, where the attack of influenza began in the mother four days before delivery. The infant died on the third day, having

had a high temperature, rapid respiration, pulmonary catarrh, and an erythematous eruption on the skin.

DISCUSSION.

THE PRESIDENT.—The youngest patient which undoubtedly had epidemic influenza, which came under my observation, was four months old.

DR. BLACKADER.—I have had no case of congenital influenza. I have had one case of congenital pneumonia, the child dying before the seventh day was hardly completed. At my request, Dr. Osler, who was in Montreal, performed the post-mortem. I had thought of cardiac disease,—some anomaly of the heart-valves,—but a small patch of pneumonia was found at the right apex. It would have been almost impossible to verify it by percussion. The patch was very limited, but was distinct, and we thought it was the cause of death. I mention it only to show how small a patch of pneumonia will at times prove fatal.

DR. NORTHRUP.—I regret exceedingly I could not hear the paper. For that reason my remarks may not be altogether in place. It may be of interest to say that at the New York Foundling Asylum there was not a case of recognized influenza in a child under two years during the epidemic. It has seemed to me that the extremes of life escaped. In children five to six years old at the Foundling Asylum, from fifteen to twenty per cent. were affected, while among young healthy adults, servants, etc., something like eighty per cent. were affected. I saw one case in private practice which I thought might be influenza, in a child ten months old, but it was very doubtful, although there was influenza through the household.

DR. FRUITNIGHT.—Cases of congenital influenza must be very rare. I have never seen any. The youngest patient I have observed with it was six weeks old. The diagnosis was positive, because all the adults and the three other children of the family, from three to eight years old, had it. This infant had characteristic symptoms, coryza, conjunctivitis, cough, fever. I certainly would not have considered it a case of the disease if it alone had been affected; but because all the remaining members of the family suffered simultaneously from influenza I think I am justified in considering the infant as also affected by the disease.

DR. HOLT.—The facts referred to by Dr. Northrup have been borne out in my experience both in private and in hospital practice; as a rule young infants were quite exempt. I saw one positive case in a child nine months old.

Dr. Scharlau said he had not seen influenza among very young infants.

Dr. Dorning.—Taking the negative side of the question: During the epidemic I had twenty obstetric cases, and in six of these the mothers suffered from influenza; in one case delivery was induced at the eighth month,—I think by the excessive coughing. In no case, however, was I able to diagnosticate epidemic influenza in the infant.

The President.—It might be a question as to the diagnosis in these cases where young babies were supposed to have the disease. I would say that in the case I alluded to, in a child four months old, the mother had the influenza at the time; was lying in bed, the baby at her side; the father had it, and other members of the family had it. This child was taken with coryza, sneezing, temperature 104° F. at first, and symptoms almost identical with those of the mother, and they passed off in due time, as did the symptoms of the mother. Therefore, I do not doubt that the disease does occur in babies of that age.

Dr. Townsend.—I opened the paper by asking the Society as to the diagnosis. As I said, in private practice and in the babies in the lying-in hospital, where there were a good many mothers suffering from influenza, none of the babies had influenza, nor anything which looked like it. But in the case related, I could not see what else it could be. There are a few cases recorded of nearly every infectious disease where the infant has been born with the disease, the mother suffering at the same time. I should like to ask the Society what the diagnosis was in my case, supposing it was not influenza.

Dr. Northrup.—My own opinion is that we should be very sceptical of a diagnosis of influenza in children under two years. My opinion is founded not only on personal observation, but upon the statement of others under whose care there are a great many children. I would ask Dr. Jacobi, who has just entered the hall, whether he has seen influenza in children under two years, and if his answer is in the affirmative, whether he has seen it under one year.

Dr. A. Jacobi.—I feel sure that I have seen cases under two years; that is, cases where the diagnosis of influenza had been made. I do not remember at this moment whether I have seen a case under one year. The younger the children have been, the less influenza have we seen in this city. That is at least my impression, and appears to be the impression of those who have had opportunity to see more cases than I. I have seen relatively fewer cases of influenza, because they are not so apt to become the object of professional consultations.

INDEX.

PAGE

Address, President Smith's annual 6
Alcohol, the use of, in the treatment of the diseases of children 148, 152
discussion, Holt 153
Fruitnight, Vaughan 154
The President, Vaughan, Chapin, Rotch 155
Chapin, Vaughan, Jacobi 156
The President, Jacobi 157
Aorta, a case of transposition of the, and pulmonary artery, with patent foramen ovale: death at ten years of age 46
Asphyxia, results of, of shorter or longer duration, immediately after birth (with presentation of case) 178

Brown, Dr. Dillon 182

Caillé, Dr. Augustus 136
Carr, Dr. Walter Lester 33
Crandall, Dr. Floyd M. 115

Dactylitis in children 60
Diarrhœa, summer, in infants 101, 109, 115
discussion, Booker 122
Fruitnight, Holt 125
Blackader 128
Diphtheria, how to prevent 136
discussion, Earle 147
Dorning, Dr. John 46

Earle, Dr. Charles Warrington 198
Empyema, a case of, with expectoration of pus: thoracocentesis . . 28
discussion, Carr 32
Koplik 33
etiology of, in children 50
discussion, Booker, Shaw 59

Fever, how to prevent scarlet 129
Fruitnight, Dr. J. Henry 28

Holt, Dr. L. Emmett 168
Huber, Dr. Francis 10

PAGE

Influenza, a case of congenital 205
discussion, the President, Blackader, Northrup, Fruitnight, Holt 207
Scharlau, Dorning, the President, Townsend, Northrup, Jacobi 208

Jackson, Dr. Henry 158
Jacobi, Dr. A. 178

Kidney, a case of sarcoma of the 65
Koplik, Dr. Henry 50

Medication, simple but efficient, in pediatrics 198
discussion, Carr, Holt, Seibert, Koplik 203
Fruitnight 204
Meningitis, on what early symptoms may we rest a diagnosis of tubercular? 69
discussion, Earle, Northrup 78
Rotch 80
Jacobi 82
Winters 84
Caillé, Fruitnight 85
Rotch, the President 86
Northrup 87
Meningocele, spurious; traumatic cephalohydrocele; acquired cephalocele 10
discussion, Fruitnight 28
Milk, human breast-, the management of, in cases of difficult infantile digestion 88
discussion, Jacobi, Holt 99
Fruitnight, Blackader, Rotch 100

Northrup, Dr. W. P. 69

O'Dwyer tubes, the construction of, with a report of three hundred and fifty cases of intubation of the larynx 182
discussion, Earle 196
Caillé 197

Peritonitis, suppurative 204
Purpura, a case of, with a few notes on the recent literature of this disease 158
discussion, Earle, Booker 164
Jacobi 165
Earle, Jacobi, Rotch 166
Koplik, the President, Fruitnight 167
Rachitis, some manifestations of, not always associated with severe bone changes 33

PAGE
Rau, Dr. Leonard S. 60
Reid, Dr. John J. 204
Rotch, Dr. T. M. 88

Seibert, Dr. A. 148
Smith, Dr. J. Lewis 6, 129
Stomach, observations upon the capacity of the, in infancy 168
discussion, Rotch, Seibert 175
Earle, Holt, Rotch 176
Holt, Jacobi, Rotch 177

Townsend, Dr. Charles W. 101, 205

Vaughan, Dr. V. C. 109

Warner, Dr. Frederic M. 65
Winters, Dr. Joseph E. 152